THE

BOBBIN & BEAKER

STUDENT PUBLICATION OF THE CLEMSON TEXTILE SCHOOL

No. 1 OCTOBER 1953 Vol. 12

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THE

Bobbin and Beaker

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VOL. 12 OCTOBER 1953 No. 1

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Textiles Need More Graduates

DR. HUGH M. BROWN

Dean of Textiles

At the last meeting of the National Textile School Deans two facts were stressed with great force. First, the whole textile industry is clamoring for far more graduates than are available and, second, that at even a time of such need the number of graduates was at the lowest level since the war. Studies showed that this was not due to any lack of real opportunity in textiles, indeed, statistics indicate that advancement in salary and responsibility was faster in textiles than most other industries.

The main causes for the condition seems to be stepped up appeals of all the so called "glamor" industries causing students to go into other fields, and the fact that the textile industry has not been bringing its unlimited opportunities to the attention of high school and college students.

Representatives from the textile press met with the textile deans and in the last few months there have been several fine articles giving analysis of the opportunities in textiles in comparison to those in other fields of engineering. Top textile executives have published statements showing that advancement in textiles usually more than makes up for the abnormally high starting salaries some other industries have been offering to get graduates. Often these high starting salaries will be ofset by a policy of slower advancement.

Many textile concerns are now going to the high schools with the real facts about opportunities in textiles. Many are conducting open house visits so every high school senior may see the modern, interesting working conditions in today's industry. They are bringing to public attention the many new engineering and research openings made necessary by so many new fibers and new processes in the mills today.

Everyone in the industry has a vital interest in helping to give the youth a full, true picture of textile opportunities. When and if this is done, more college students will chose textiles.

THE STATE FLAG OF SOUTH CAROLINA

C. H. Ferguson

The cover of this magazine is a picture of South Carolina's state flag. If the blue flag, which flies over our state institutions does not coincide with this flag, it is a natural thing because no law has been made governing its structure. The law states that the colors shall be blue and white, and that the symbols shall be a crescent and a palmetto tree, but further details are not given. Therefore, the color blue could be any of the various shades of blue and the palmetto tree, a picture of any of the different kinds of palmettos.

Gov. Byrnes established a law that the Clemson College Textile School would manufacture the state flag and would sell it at cost to anyone who wishes to purchase this flag.

Clemson's first step was to establish a standard palmetto and its flag's color. This tree is the one pictured on this on this magazine and the color is National Blue. This will be the standard state flag until the State Legislature establishes a law stating the exact design and color of our state flag.

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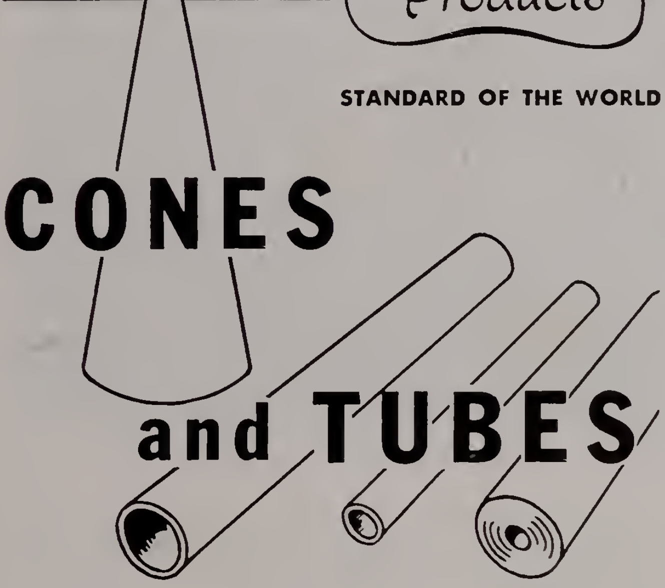

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DEPENDABLE SOURCE OF SUPPLY

Principal Properties which New Fibers Impart to Fabrics

Howard R. Hart

Editor's Note:
(Address delivered by Mr. Howard R. Hart, manager of Burlington Mills' Brighton Division, before the spring meeting of the National Council of Textile School Deans at Panama City, Fla., April 29, 1953)

In any discussion concerning the future of the textile industry, we of Burlington Mills feel that the new and so called miracle fibers occupy a large place.

These fibers—Orlon, Dacron, Acrilan, Dynel, and Viscara—are called new and rightly so. They are so new we don't know all we would like to know about how to construct the best fabrics from them, nor do we have all of their properties under control. However, we do know the major properties which each of them adds to a piece of cloth, and we also know some of the short-comings which remain to be overcome.

Some of the first questions that naturally come to mind are these: "Where do they belong—what types of apparel will they be used in—what will they replace—what will they compete against?"

We know that these fibers were not brought out as substitutes. They are, rather, fibers that are in some cases better, both from a standpoint of performance and aesthetics, than the natural fibers. They are the result of attempts to improve on the natural fibers.

These new fibers fall into three broad groups, which differ from each other just as rayon does from acetate (which difference the Federal Trade Commission has finally come to recognize).

These three groups are:

1. Acrylics	Orlon; Acrilan; Dynel; X-51
2. Polyesters	Dacron
3. Polyamides	Nylon; Perlon

I would like for a moment to enumerate the outstanding characteristics of each of these fibers, with the exception of nylon. I would like to point out the characteristics which are important to the user of the fabrics and to the apparel made from them. I will not attempt to discuss specific fabrics as there are too many of them for the time available.

The first of these is Orlon—made in both filament and staple form.

What makes **filament** Orlon desirable?

It has a good hand, is warm, is the nearest to silk of any synthetic.

It has a good drape, crisp and lively.

It does not pucker in sewing as readily as does nylon, and is easier to cut and sew.

It has good dimensional stability, that is the shrinkage in washing is good.

Its resistance to wrinkling is good. No special finishes are necessary.

It takes pleats that are durable to washing—creases can be ironed out and put back in at the same temperature.

Its sunlight resistance is the best of any synthetic fiber.

It is quick drying.

It can be cross dyed with nylon and silk readily and with viscose in most shades.

These characteristics indicate that its use will be in:

Washable woven and knit dress and blouse fabrics, shirts which dry quickly and require little if any ironing. In combination with silk, and with cotton chambrays. It's one of the best fibers for curtains. It also has minor uses in industrial and diversified outerwear fabrics.

Filament Orlon has been in production since mid-1950.

Orlon **staple** has these characteristics:

Outstanding warmth. It has 20% more bulk than wool. It offers warmth without weight—for the same thickness, it's lighter than wool in weight. Even 25% added to rayon increases its warmth.

Although warm, it does not always have a wool like hand—it depends on the construction and the finish.

Crease retention. Pants or pleats wet in the rain or washed retain their crease. It has 85% retention against 20% for wool after wetting and drying.

Its wrinkle resistance and recovery from wrinkling is good.

It dries more quickly than wool.

It is not attacked by moths or mildew.

Resin is not necessary for shrinkage stabilization. It will not shrink or felt like wool.

Orlon staple is very adaptable to the woolen system of spinning. It can be readily spun on cotton systems, meaning that fabrics can be woven at a lower manufacturing cost than worsteds. Blended with viscose, it gives loft, bulk and warmth.

The principal initial uses of Orlon will be these:

Suitings and coatings for fall and winter—men's and women's.

(Continued on page eighteen)

New Frontiers

By C. B. Hayes, Sr.
Vice President Pacific Mills, Lyman, S. C.

Young men always seek new frontiers, geographically or in fields of endeavor. Thirty years ago the textile frontiers in this state were relatively undeveloped, though the great native South Carolina pioneers had brought the industry into real being. New England still was the giant, but was beginning to lose its grip.

It happened that the writer was among those who left New England to come to South Carolina in 1925. That circumstance of having had some experience in both areas perhaps is the reason why The Bobbin and Beaker kindly offered this opportunity to make a few comments addressed especially to the young men who are getting ready for careers in the textile industry.

Why was the industry slipping away from New England?

1—Adverse attitudes of shortsighted local and state politicians, who for reasons of their own joined with other radical elements in the false notion that the owners and managers of industry should have their responsibilities usurped.

2—The failure of many workers to understand the danger of following unwise leadership, and the resulting trend away from the everlasting fundamental that a man must work for his pay.

3—The tragic failure of whole communities and states to protect the advantages they enjoyed, and to strive to advance farther in the forefront of sound and constructive development.

While New England thus was faltering, the South was waking up. Where the young men of South Carolina formerly had been compelled to seek new frontiers in other states, the frontiers of industrial progress were rising, and more and better opportunities were opening up at home. The story of South Carolina's growth is new and fresh in the minds of all. Since World War II, for example, the fine Textile School at Clemson has become the largest and best in the nation.

The future looks bright after nearly a decade of phenomenal development with dozens of new plants in operation and most of the older ones modernized and expanded. But we should pause and remember New England, not forgetting either that as late as the thirties and the early forties, South Carolina barely escaped the tragedy of that section. There were the same kind of radical forces influencing some of the politicians and some of the working people. Drastic and destructive pieces of legislation not only were being proposed at every session of the General Assembly, but they were often on the verge of adoption. There came abrupt halts in the state's progress as industrial prospects saw the dangerous borderline on which the shortsighted politicians and radical elements were treading.

C. B. Hayes, Sr.

Fortunately, however, there were enough honest, aggressive and intelligent leaders in the state to reach out desperately and hold in check the men who espoused socialism and "something-for-nothing." Crisis was survived, all the while costing the state dearly. Then almost suddenly the tide swung unmistakably at the polls and in the legislative halls. New confidence in South Carolina spread over the nation, replacing the former widespread belief that every

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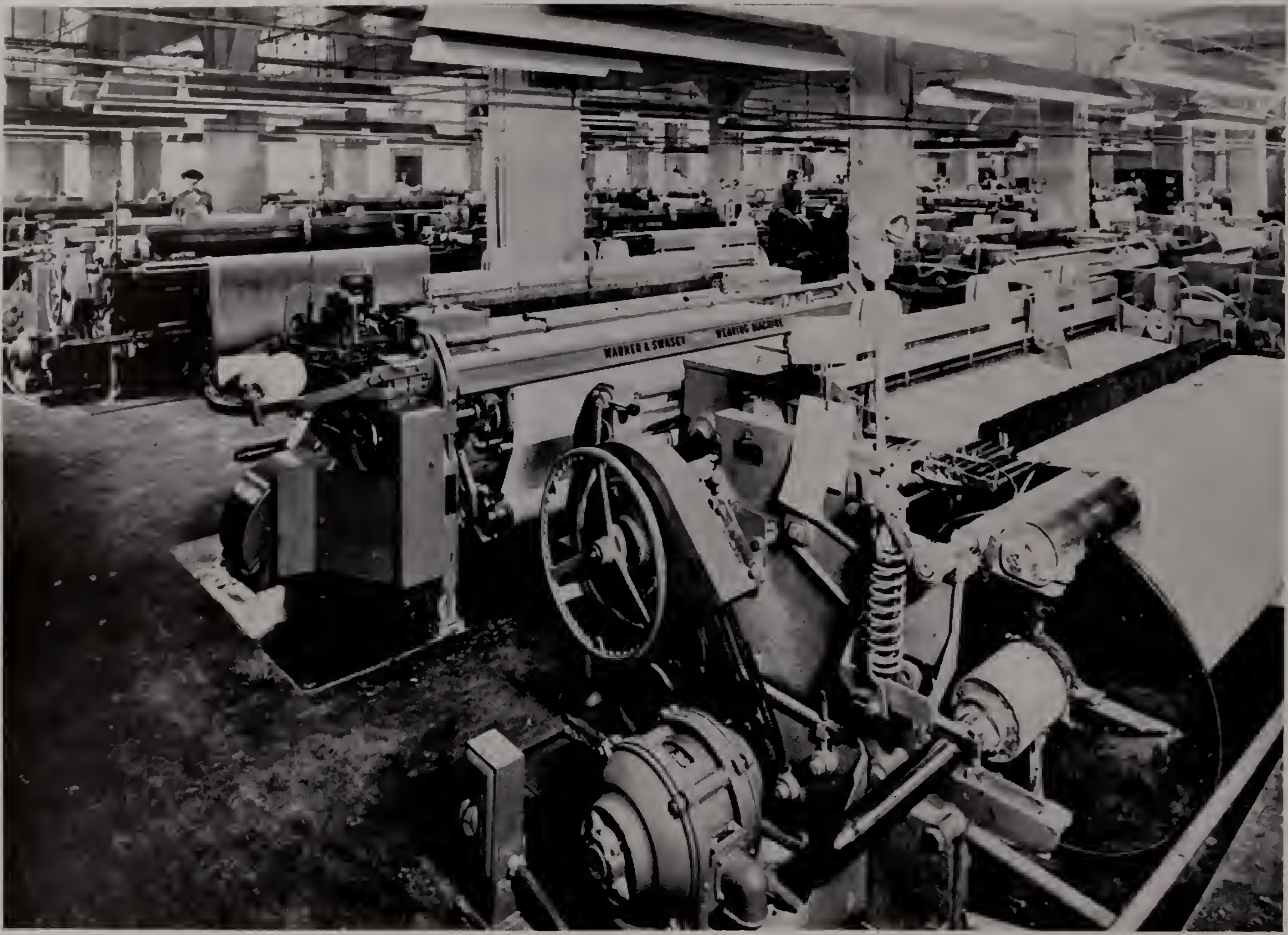

New Weaving Machine

H. B. Hunter

The Warner & Swasey Sulzer Weaving Machine as you see it today in operation in many of the textile mills has taken a great many years to bring to its present state of high perfection. The original patents are held by the Sulzer Brothers Limited of Switzerland. Between 1935 and 1943 Sulzer Brothers designed and built five different models of the machine. Each successive model showed changes and improvements. In 1945 just two days after VE day, the Warner & Swasey Company sucessfully negotiated contracts to build the machine in this country.

In 1946 four of the Swiss machines were brought to Cleveland for test purposes. Weaving tests were carried on to an exacting degree while the design of the machine was studied and cost estimates of its production were made. The studies proved that the machine was especially practical from a weaving point of view but the design of the machine had to be simplified to fit American methods of manufacture. This change in design was a tremendous job because it required going over every detail of its construction with the idea of redesigning for simplicity and ease of manufacture. Every dimension had to be changed from millimeters to the inch system of measurement. The weaving machine as it was built by Sulzer was a beautiful example of sound design and precision workmanship, but cost of manufacture had not been particularly considered and it would have been impossible for us to build and sell the Sulzer machine as originally designed.

The first Warner & Swasey machines were completed and placed in various textile mills sometime in 1948. These prototype machines caused considerable confusion because the industry felt these were the completed machines when actually they were

(Continued on page ten)

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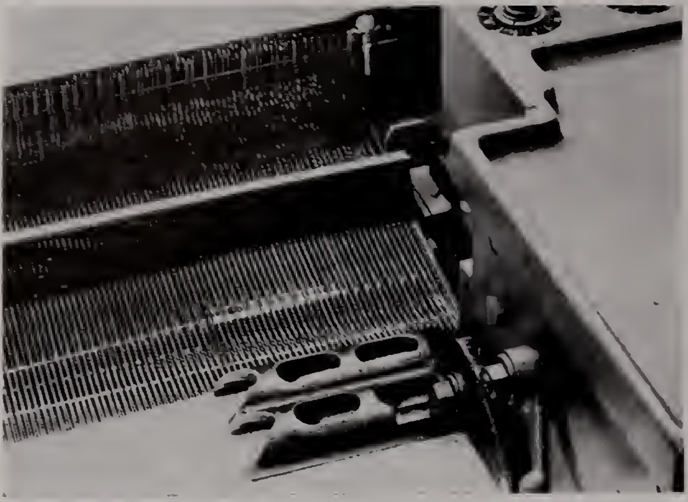

NEW WEAVING MACHINE

(Continued from page eight)

prototype machines and were put into the field for testing purposes only. Their sole purpose was to find out how they would operate under regular working conditions. From these tests emerged the Warner & Swasey Sulzer machine that is now operating in the field. At the present time there are more than 500 of these machines operating in various phases of the industry. There are a few operating on cotton and a few on spun rayon while the rest of the machines are operating on woolens and worsteds. At the beginning the majority of the machines were purchased by worsted manufacturers because a large number of their fabrics readily lended themselves to the present limitations of the machine namely; an eight harness capacity with a six pick repeat and a single color filling. At first it did not seem that a machine with these limitations could fit into the worsted field because the majority of worsted looms have a twenty-four harness head motion and a four by one selective color box motion. However, a quick analysis of a large percentage of worsted fabrics shows a single color filling and the two up, two down, 450 twill. A large percentage of the remaining fabrics are either a plain weave or a two up, one down, three harness twill.

The machine soon proved itself both practical and economical in the weaving of worsteds and woolen manufacturers quickly became interested in it for the weaving of such plain fabrics as bed blankets, flannels, automobile sidewalls, dress goods and coatings.

In the beginning there was a strong reaction against weaving woolen and worsted fabrics without mixing the filling. This feeling is still quite a challenge and as a result we are building a pick and pick filling mixing motion. However, there are a large number of fabrics that can be successfully run with only one filling on the weaving machine that would cause trouble when woven on a conventional loom. This can be attributed to the unique device of tensioning each and every pick after it is inserted into the shed.

There are several important features of the Warner & Swasey weaving machines that are obvious at first glance. Perhaps the most obvious of these features and the most important is the large filling supply package located at one end of the machine. The large cone of yarn that is normally placed on the quilling machine is placed directly on the weaving machine. Normally two of the packages are tied together by the conventional heel-to-toe tying, thus forming a continuous supply of filling that will sometimes last for several hours. This filling supply package is important because the impact of it is felt in many other places besides the weave room. There are no bobbins to bother with, no magazines or batteries to fill and where each cone is completely exhausted there is no bobbin stripping. The cost of quilling which sometimes amounts to several cents per pound is completely eliminated. In addition to the savings of the operating cost of quilling there is less floor space required, elimination of the capital investment for quilling machinery and many miscellaneous items such as identification marking, handling and transportation.

Other items which will attract your attention are the absence of overhead works and the clean smooth lines of the machine with practically all the moving

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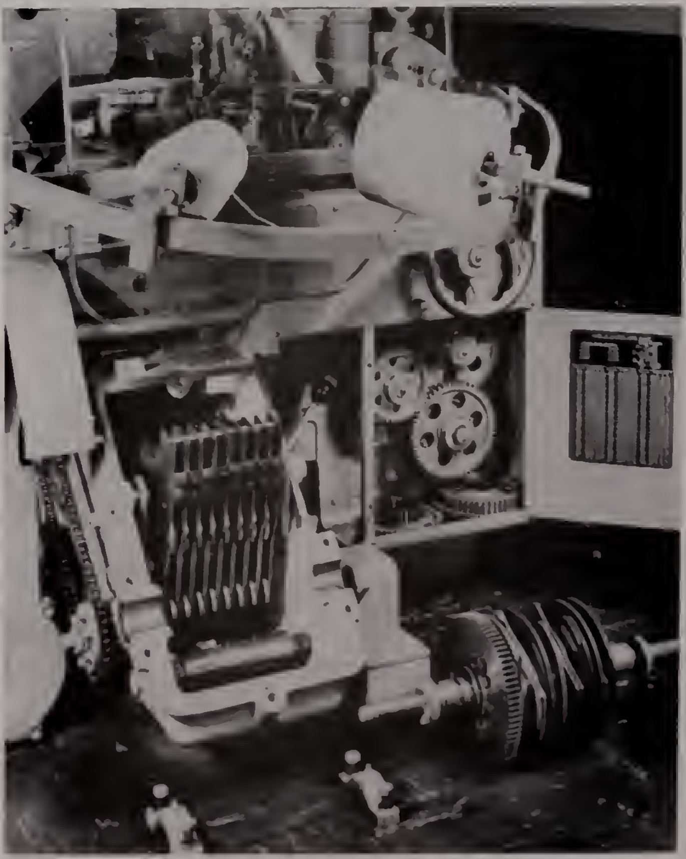

Work at USDA Clemson Cotton Laboratory

By J. M. Cook

The development of a basis for evaluating the quality of cotton has required continuous research over the years. Various methods of evaluating quality have been used, such as the comparison of samples in question with samples of known quality or "types," purchasing on the knowledge of place of growth, and purchasing on the basis of standards for grade and staple length. In recent years these methods have been supplemented to some extent by laboratory tests of specific physical properties of cotton fibers.

Standards for grade are based on the color of a sample, the foreign matter present in the cotton, and the preparation of the sample. Staple length reflects the length of the typical portion of fiber in cotton.

The idea of using selected samples of cotton and processing them to determine their spinning qualities in relation to grade of cotton was first used by the United States Department of Agriculture about 40 years ago. This information was needed in connection with the proper development and use of standards for grade and staple of American cotton. Tests were run at mills in different sections of the country. Samples in quantities of several bales were used as individual lots and processed through cooperating mills. Data were obtained at all the processes and analyzed and put into report form. Some cooperative work was also done at the New Bedford Textile School. Later, a staff of cotton technologists was located at North Carolina State Textile School, Raleigh, N. C., where spinning tests were carried on. In the late 1920's, after the project was moved from Raleigh, N. C., to Clemson, S. C., the quantity of cotton necessary to run a spinning test was reduced to less than 250 pounds. By the use of individual machines with fewer spindles, the quantity of cotton was further reduced to 50 pounds. This quantity was used until the middle 1930's. Special techniques were then developed so that reliable data could be obtained from samples of 5 pounds. Testing through research has developed rapidly since that time.

(Continued on next page)

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WORK AT U. S. D. A.

(Continued from page eleven)

For a number of years the Department's research and testing work has included fiber testing along with the spinning work, as well as a study of the relationship between the fiber properties and the spinning quality. This work has yielded such valuable information that it is now possible to predict, through the use of fiber tests and classification, the relative spinning quality of different samples of cotton with a fair degree of accuracy.

An accumulation of spinning test data along with the classification of each lot has been built up over the years. From these data the average spinning quality criteria have been determined, and these serve as "benchmarks" for yarn skein strength levels for different staple lengths, and percentages of manufacturing waste extracted from different grades. The average skein strengths for 22s and 36s counts of carded yarn for different staple lengths are as follows:

Classer's staple length (inches)	Average skein strength for 22s	
	22s	36s
	Pounds	Pounds
7/8	95.0	50.9
29/32	99.1	53.5
15/16	103.3	56.0
31/32	107.4	58.6
1	111.6	61.1
1-1/32	115.8	63.6
1-1/16	119.9	66.2
1-3/32	124.1	68.7
1-1/8	128.2	71.3
1-5/32	132.4	73.8
1-3/16	136.6	76.3
1-7/32	140.7	78.9
1-1/4	144.9	81.4

The average waste percentages extracted at the laboratory from different grades are as follows:

Grade	Average picker and card waste Percent
Good Middling	6.3
Strict Middling	7.2
Middling	8.1
Strict Low Middling	9.3
Low Middling	12.5
Strict Good Ordinary	15.6
Good Ordinary	18.3

It was found that the twist inserted in the yarn to give optimum strength has a definite relationship to the fiber properties. Generally, the length is the most important fiber property in this connection. Accordingly, comprehensive tests were run to determine the optimum twist for different lengths. These were found to be as follows:

Staple length (inches	Twist multiplier
7/8	4.70
29/32	4.60
15/16	4.45
31/32	4.35
1	4.25
1-1/32	4.20
1-1/16	4.10
1-3/32	4.05
1-1/8	3.95
1-5/32	3.90
1-3/16	3.85
1-7/32	3.80
1-1/4	3.75
1-9/32	3.70

IMPORTANCE OF FIBER PROPERTIES

The Cotton Branch of the Department of Agriculture operates testing laboratories at the following locations: Clemson, S. C., College Station, Texas, Mesilla Park, N. M., Stoneville, Miss., and Washington, D. C. The fiber properties measured in these laboratories for a number of years have been fiber length, fiber length uniformity, strength, fineness, and maturity. These properties bear a definite relationship to manufacturing processing and the quality of the end product. Generally, the influences are as follows:

Fiber length contributes to the fineness of the count of yarn that can be spun from a cotton. It also influences the strength of yarn manufactured.

Fiber length uniformity has an influence on the uniformity as well as the strength of the yarn spun.

Fiber strength is an important factor in determining yarn strength. Cottons with good fiber strength usually give less trouble in manufacturing than do the weak-fibered cottons.

Fiber fineness also contributes to yarn strength. Fineness imparted by immature fibers, as may often be the case if an airflow instrument alone is used as the measuring instrument, is not desirable in a sample.

Fiber maturity has an influence on the neppiness of the product made from a sample of cotton. Maturity contributes to the manufacturing performance, the less mature samples giving more trouble in processing. Cottons differing in degree of maturity do not dye uniformly.

TWO IMPORTANT DEVELOPMENTS

The research and testing work in the United States Department of Agriculture is designed to benefit not only the cotton farmer, but also the cotton breeder, the cotton merchant, and the textile manufacturer. One great difficulty, which is being overcome slowly, is to convey the proper meaning of the test results to laymen who are unfamiliar with the terms used. The development of the Yarn Appearance Grade Standards, which was accomplished at the Clemson Cotton Laboratory and adopted and which are now being sold by the American Society for Testing Materials, was an outgrowth of the need to measure the

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NEW WEAVING MACHINE

(Continued from page ten)

parts totally enclosed. The harnesses are operated from the bottom and instead of the lay projecting beyond the machine it operates between the two main parts namely; the picking box and the receiving box.

Basically the operation of the weaving machine is the same as any method of weaving. That is, heddles strung on harness frames open the warp yarn into two groups forming a shed. A pick of filling is passed through this shed and this pick is pushed to the fell of the cloth by a reed. At this point the similarity ends because the mechanical methods used to perform these basic operations is entirely different. The shedding motion is cam operated with the cams located at the side of the machine. It operates the harnesses postively in both directions because each cam is in reality a pair of cams permanently fastened together. One cam for raising the harness, the other cam for lowering the harness. This cam housing is shown in the photograph W-117 and as may be seen from the photograph it has an eight-harness capacity. At the top of each lever or roller arm are adjustment points for controlling the size of the shed opening and for positioning the shed height. The motion of these cams is transmitted to the harness drive rods and lifter rods shown in photograph W-105. Each harness locks in position at the top of these vertical lifter rods. This eliminates the necessity of levelling off the harnesses when changing warps because one set of harnesses will always be in the same position as any other set. All the cams are of the same diameter and have the same throw, therefore, it is unnecessary to keep them in sets. The cams are reversible which means that the cams for a warp twill form a filling face twill when reversed. There is a levelling bar for levelling the harnesses and with this done the entire cam shaft and cams may be lifted out after removing only our cap screws.

The machine may be equipped with a harness levelling and pick back attachment. The harness levelling attachment automatically levels the harness each time the machine stops for a warp or filling break. The pick back allows the operator to find the pick by running the harness motion backwards without operating the rest of the machine. This attachment is necessary for finding the pick when a machine is equipped with the pick and pick filling mix unit.

The reeds used are similar to standard metal or pitch band reeds except they are heavily reinforced by two metal strips 3/4" high soldered to the bottom of the reed. This bottom reinforcement is securely clamped to the lay bar, the top of the reed is free using no reed cap or hand rail and thus making it easier for a weaver to pass ends through the reed. The width of the reed must be exactly the same as the spread of the yarn in the reed. For example, a

(Continued on next page)

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warp of 3,600 ends set 40 ends per inch over 90-inches dented 2 ends per dent would require a reed 90 inches wide and with exactly 1,800 dents. This is necessary because as stated before, the reed operates between the picking box and receiving box.

The shuttle is guided across the machine by metal guide teeth spaced 1/4" apart assembled in blocks of four teeth per block. These guide teeth are precision made and must align perfectly with each other because there is only .008 clearance between the guide teeth and the shuttle. With this type of shuttle guiding it is impossible for a shuttle to come out or be deflected which eliminates long filling skips or shuttle floats and as the shuttle does not touch the reed at any time, reeds last indefinitely.

The lay is operated by a cam and counter cam driving a roller shaft. These cams and shafts are very carefully fitted and matched so that all play is removed. The lay bar is stationary for 2/3 of the machine's cycle or while the pick is being inserted and tensioned. During the other 1/3 of the cycle the lay pushes the pick to the fell of the cloth and returns. This action is quite different from the conventional in that the lay arms or lay swords are only about 7 1/2" long and the lay makes a short arc forward and downward. The reed hits the fell of the cloth perpendicular to the fabric and the guide teeth pass below the cloth. These guide teeth are open at the back and as they move forward and down they leave the pick in the shed just ahead of the reed.

The shed opening is rather small because the shuttle is only 1/4" high, therefore, as long as we get a clean shed opening the shuttle will pass through without interference. The maximum lift of the harnesses is close to the minimum lift on a woolen and worsted loom but because the harnesses are closer to the fell of the cloth the angle is slightly greater. This reduced harness motion aids in reducing end breakage. In addition, the shed is fully open while the shuttle is travelling through it. As a further aid to reduce end breakage, the reed travels about 3 1/4" which is about 1/2 the distance normally travelled.

The heart of the picking motion is the torque rod which supplies the lightening fast power used to shoot the shuttle across the machine. This rod is cocked or set by a heavy winding cam and when set the torque rod is twisted about 250° to 30°. The pick is fired by the firing cam tripping a toggle joint and the power is transmitted to a picker arm about 7" long. Attached to the top of the picker arm is the picker shoe which is guided top and bottom by two tracks, one of which also guides the shuttle. These tracks always keep the shuttle and picker in perfect alignment.

There are a number of shuttles in operation at one time. While one is being picked through the shed there are others that are slowly being returned by a conveyor chain and others are being held at the receiving box to be dropped on the conveyor at the proper interval. An approximate rule to follow is, there will be a basic number of six shuttles plus one for every 10" of cloth width. That is, a 70" piece of cloth will require 13 shuttles. As each shuttle in turn is positioned, supplied with filling and fired across the machine the filling runs free without tension for approximately 2/3 of the passage. For the last 1/3 of the passage two independently operated brake feet press the filling against a flexible steel strip called a filling cushion. At the receiving box the shuttle is slowed down and stopped by two adjustable shuttle brakes. In slowing down and stopping the shuttle passes an inch or two past the selvage and must be accurately returned to a definite position after each pick.

While the shuttle is being positioned, a tensioner arm at the picking side of the machine rises to tension the pick. The rise of the tensioner arm is always greater than the return of the shuttle, therefore, when the tension of the pick is equal to the frictional force of one filling break, the additional rise of the tensioner arm pulls the filling through the brake foot. This means that regardless of how each pick is inserted, either tight or loose, it is uniformly tensioned before the reed pushes it into the cloth. As soon as this pick is properly tensioned grippers on each side of the machine reach forward and grasp the pick close to the selvages. At the receiving side the shuttle springs are opened to release the pick. At the picking side the shuttle feeder moves forward and closes on the yarn before the pick is cut by scissors operating between the feeder and gripper. The reed and gripers move forward simultaneously to bring the pick to the fell of the cloth. The shuttle that has just completed its passage is pushed sideways into the expeller box where it awaits its turn to drop on the conveyer and be carried back to the picking side. While the next pick is being inserted a pair of tucking needles, one on each side, reach through and pull the ends into the shed to be bound by the following pick. Here it should be pointed out that these ends which have been tucked are approximately 1/2" long. This means that when they are doubled back and bound into the cloth there will be a 1/2" selvage with twice as many picks as the body. These additional picks are compensated for by reducing the number of ends in the selvage and sometimes by reducing the size of the selvage yarn.

For preventing damage to the machine and to the fabric, there is a detector system which releases the clutch whenever anything interferes with the proper operation of the various levers and motions in the picking and receiving box. When this detector sys-

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tem is tripped it is impossible to engage the clutch until the trouble is found and corrected.

The filling detector operates at the side of the machine and fells the filling as it is being picked. If there is a filling break or if the filling is slack, the machine stops immediately. The warp stop motion is the conventional type using a top contact electric drop wire. Or the machine may be equipped with adapters for using other electric stop motions

The take-up motion has a semi-low take-up roll with a constant worm drive. An item worthy of mention is a complete range of picks from 13 to 102 are provided by 8 pick gears. Various combination of four of the eight gears are used as indicated by a chart located on the inside of the hinged door. Space is provided in the bottom of the take-up housing to store the four gears not in use.

The let-off is a fully automatic let-off incorporating a spring loaded vibrating whip roll. Once the let-off is correctly adjusted for the style being run it does not have to be changed for the duration of the warp or as long as that same style is being run in the machine.

It would not be correct to discuss the Warner & Swasey Weaving Machine without mentioning its advantages for weaver and loom fixers. The weaver's job is lightened considerably. The machine is very easy to operate and it operates entirely under power. It always stops at a different position and one which is correct for repairing a filling break. There are signal lights which indicate why the machine stopped. A red light indicates a warp stop and a blue light a filling stop. If the machine stops without a light showing and the detector rod is tripped, it indicates a mechanical stop.

The loom fixer's job is not any harder than it was before but it is different. Of course, he must learn an entirely new technique and use different equipment and tools. The majority of adjustments are made with feeler gauges and a set of small allen wrenches. Once adjustments are made, they remain as they are set. All setting and adjustments are timed by the index wheel located on the drive end of the machine. By using this simple system all the guess work and differences of opinion between loom fixers is eliminated. Each setting must be made to an exact degree position.

Burling and mending is greatly reduced because some defects such as filling drag-ins or side lines and filling kinks are completely eliminated and other defects are greatly reduced.

PHI PSI NEWS

By Arthur B. Swett

IOTA CHAPTER NEWS

The news from Iota Chapter of Clemson at the present time is concerned mostly with new pledges, a banquet, and Honorary Degrees, with an item on Phi Psi men who have recently graduated.

As soon as possible the chapter will take in the new pledges for the first semester. Just how large this pledge turn-out will be is unknown as yet. Pledge invitations will be sent out and a smoker party held for the new pledges within the next few weeks.

The first Phi Psi banquet for the current school year has been planned for October 30 at the Clemson House. Dr. L. H. Hance will be the speaker. The conferring of Honorary Degrees will be held immediately after the banquet in order that the candidates may be guests of the chapter at the banquet. All alumni members who wish to attend the banquet should contact the Iota Chapter Secretary, Box 864, Clemson, South Carolina.

As it has already been mentioned, the awarding of Honorary Degrees in the Phi Psi Fraternity will be held October 30 following the banquet. These degrees will be awarded to men associated with textiles, who the chapter feels should be deservingly recognized for outstanding contributions to the textile industry and to the education of textile students.

Recent Clemson graduates included 18 Phi Psi men, who we of the chapter were glad to see obtain this measure of success but regretfully notice their absence from the ranks of active members. Those graduated in Textile Chemistry were W. P. Creighton and F. L. Wickham. Graduating in Textile Engineering were M. R. Bridgeman, R. M. Cook, C. R. Mabry, M. C. Robinson, and T. E. Wessinger, Jr. And those graduating in Textile Manufacturing were W. R. Bridges, W. C. Compton, J. C. Crumpton, R. R. Fowler, R. L. Garrison, E. J. Gilliland, A. B. Hair, J. R. Kaiser, J. J. Poupalos, and R. V. Smith.

Since the last issue of the **Bobbin and Beaker** it has been requested that this column explain a few facts about the Clemson Phi Psi Chapter and how its men are chosen. Actually the Phi Psi is a national organization of nine active chapters located at institutions teaching textiles, with Clemson being the seventh or Iota Chapter. The Grand Council Executive Secretary is also located here at Clemson. The Fraternity is bonded together in brotherhood for the purpose of promoting good fellowship and higher standards among textile students while encouraging them onward to a successful career in textiles. In keeping with the objective of maintaining high standards and scholarship through the fraternity, it has been and is now Clemson's policy to pledge the sophomore with the highest scholastic average for each regular semester, and to pledge juniors and seniors with a grade point ratio of at least 2.6 and 2.3, respectively. This is based upon a "4" grade point system in which an "A" counts "4", a "B" counts "3", etc., and these are averaged out to give the students grade point ratio. We feel that this policy encourages scholarship among Clemson textile students and insures a good, all-round reputation for Iota Chapter and the Clemson School of Textiles.

N.T.M.S. TAKES IN NEW MEMBERS

N.T.M.S. opened its 1953 session with the new president, Carl B. Brabham of Dalzell, S. C., presiding. The Society has taken in nineteen new members for this semester. They are: M. A. Mihlstin, B. L. Speareman, F. H. Simpson, C. R. Starnes, W. F. Harper, L. A. Cooper, R. M. Ashmore, J. A. Templeton, R. E. McClure, T. W. Jenkins, J. S. Carlisle, W. T. Bowen, C. H. Ferguson, H. W. Elrod, B. R. Fox, D. R. Gentry, C. A. Graves, T. McCullough and H. P. Johnson.

Leon A. Cooper of Columbia, S. C., was elected as Sergeant-at-Arms from the new members. Other officers for the '54 session are: Vice President, Ben K. Chreitzberg of Williamston, S. C.; Secretary, J. Frank Byrd of Graniteville, S. C.; Treasurer, Robert T. Mitchell of Greenville, S. C.; Corresponding Secretary, Robert S. Calabro from New Jersey, and Publicity Secretary, George R. Morgan, Jr., of Greenville, S. C.

Professor Hubbard was selected to assist Professor Campbell as advisor for the organization this year and will assume full advisorship in September of 1954.

One of the chief aims of this chapter for the year is to start new chapters of N.T.M.S. in other textile schools of the country.

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PRINCIPAL PROPERTIES WHICH NEW FIBERS IMPART TO FABRICS

(Continued from page six)

Dresses and sport shirts for fall and winter and spring.

Blends with wool will be seen, as Orlon will add crease retention, durable pleats that are washable, wrinkle recovery, and warmth with lower weight.

Acrilan is an acrylic fiber and is made in staple only. It is made by the Chemstrand Corporation which is a company set up by the American Viscose Corporation and Monsanto Chemical Company.

Acrilan is very similar to Orlon in most characteristics such as warmth, crease retention, wrinkle recovery and dimensional stability. It will be used in the same type of fabrics in competition with Orlon.

Dacron is duPont's polyester fiber. It is made in both filament and staple. Du Pont is the only manufacturer; however, it is being made in England under the name of Terrylene.

Filament Dacron is nearer to nylon in hand and behavior than Orlon, but is different from nylon in that it is:

Stiffer, more rigid and more resilient.

Doesn't stretch as easily or have as much elasticity as nylon.

Easier to sew without puckering.

Offers ready washability and won't shrink.

Quick drying.

Can be dyed wash fast.

Filament Dacron does, however, pill like rayon. Its place is in fabrics for the following:

Washable blouses, dresses and shirts, washable cord suitings, curtains, and industrial fabrics.

Filament Dacron is not good for hosiery as it is not sufficiently elastic.

The outstanding characteristics of Dacron staple are as follows:

Resiliency, wrinkle resistance, wrinkle recovery, and crease retention. Its wrinkle resistance is as good when wet as when dry. It is superior to wool and all other synthetics in this respect. Its abrasion resistance is high, almost equal to nylon, but it also pills like nylon.

It develops static from wear and changeable weather conditions.

It is dimensionally stable and readily adaptable to washable garments.

There are good drape and tailoring qualities in Dacron. It is excellent for summer weight suitings and slacks as well as spring and fall garments.

Washable slacks may be laundered without shrinkage or loss of crease and with very little need, if any, of pressing.

In blends with viscose, these properties of wrinkle resisance are imparted to the blend, although resin is necessary for the best results when Dacron is below 75% of the blend. It blends well with wool to improve wool.

Dynel is manufactured by Carbide and Carbon Chemicals Corporation in staple form only. It has a warm, soft hand and other properties of Orlon and Acrilan, **but**

It has a low softening temperature.

In 100% Dynel fabrics, it fuses, glazes and gets stiff at the rayon setting on an iron unless a press cloth is used between iron and Dynel fabric.

Dynel has outstanding resistance to burning and to chemicals, and will be used in fabrics where such resistance is important.

It should be good for half hose, knit goods, sweaters, etc., which don't require ironing or pressing, also for chemical work clothing.

Vicara is manufactured by the Virginia Carolina Chemical Corporation. It is staple and has been in production some time.

Vicara has the most cashmere-like touch of any synthetic. It is best used for blending with other fibers such as nylon, to improve the hand, with wool to soften, and with rayon, to make a woolier touch.

It is also readily dyeable.

In using these new fibers, there will be:

Fabrics made of 100% new fibers.

Fabrics of blends and combinations with rayon, acetate, nylon, wool, silk, and cotton to combine the good features of each to get cross dyes and styling, and to get lower cost.

The volume will be in the blends which offer lower cost.

In summary then, the outstanding characteristics in general which these new acrylic and polyester fibers possess over rayon, acetate, wool and cotton are:

Hand and drape

Wrinkle resistance without special finishes.

Quick drying with little need of pressing and ironing

Durability—to wear or abrasion

Crease retention

Warmth—in case of acrylics

Washability — then some dyeing problems have been overcome

Styling through combinations

Price stability

Insect proof

All of these add up to garments with lower maintenance costs, and clothing that is easier to care for and less costly to keep clean and fresh.

RAMIE

By Max Gainor '54

Ramie is defined as an Asian perennial plant with strong, lustrous, bast fibers capable of being spun into various coarse light-weight fabrics resembling linen.

The history of ramie dates back several thousand years. Ramie originated in China and the Maylayan countries and is better known to the trade as China grass. Its biological name is Bochmeria Niver — Niver meaning snow white which is the color of the finished fibers. The Egyptians used ramie fibers for wrapping mummies, and this plant was mentioned in the Chinese Treatise in 2200 B. C.

To date, the production of ramie fiber on anything resembling a commercial scale has been limited to Oriental countries having cheap labor. Mass production has been limited by lack of efficient methods for mechanical decortication. Decortication is the process of removing the bark and pith surrounding the ramie fibers without damaging the fibers themselves. In China, decortation is done by hand, the workmen scraping the ramie fiber from the green stems with crude implements. In this way only a few pounds of fibers can be separated each day. In our country any kind of hand process for an operation of this nature would be too expensive. Another trouble has been the cost of harvesting the ramie crop. When growing naturally, some ramie plants mature before others, even though all of them were planted at the same time. In the past, this difference in the state of maturity has made hand harvesting a necessity, and has practically ruled out mechanical harvesting. Recently, however, careful cultivation and fertilization and overall good management have smoothed out this uneven growth. Today, ramie plants cultivated in the United States have an even, steady growth that makes mechanical harvesting practical.

With the harvesting problem simplified, there still remained the need of an efficient mechanical decorticating and degumming process. The lack of such a process has been the holdback to production and use of ramie in this country. Without such a process, no American industry could compete with Oriental coolie labor.

Machines designed for scraping away the back and pithing core of the ramie plant from the valuable fibers have been of two general types. There is the larger, centrally located type of decorticator that is capable of separating the fibers from the stems of plants grown on thousands of acres. The other is a smaller, portable machine that can be set up in the fields where needed.

One of the companies that has been going in for ramie research in a large way has recently announced the perfection of a decorticator with a daily capacity of 20,000 pounds as compared to the few pounds per day by coolie labor.

Just a few of ramie's possibilities include corduroy that is better than the standard cotton corduroy, inexpensive suits that cannot be distinguished from wool. Since ramie absorbs a lot of water and has a tendency to swell, it is used in submarines as packing around the propellers. Because it is stronger when wet, ramie also makes superior cordage, fishing nets and sails. In fact, it is a matter of record that ramie fiber is adapted to the widest range of uses among known textiles. Ramie can be used alone or in combination with cotton, rayon and wool.

The fiber is only a small part of the entire plant. Since the leaves and stalk tops are rich in vitamin A and protein, they make fine food for cattle. Its yield per acre is said to be higher than any other protein-producing vegetable. Ramie sauce for cooking is claimed to have a salty meat-like taste. This could prove to be a boon to people on a salt free diet. Ramie waste has been found to yield such valuable chemicals as chlorophyll and industrial proteins—all potentially valuable in chemical processes. Pectin, from the ramie gums, is widely used in the food and cosmetic industries.

Ramie has been defined as a perennial plant and it is usually grown from root stocks although it can be grown from seed. This plant prefers a warm climate and is grown successfully in California and Florida. When stocking a new field, sections of the root about 4" long are set at two to three foot intervals in rows, four feet apart and covered with a thin layer of soil. Usually the roots will burst into life within two weeks. During the first year in a new field, the weeds have to be controlled, but after that, the plant becomes so well established that it crowds out all other growths so that weeds are no longer a head-

(continued on page twenty-four)

NEW FRONTIERS

(Continued from page seven)

year some members of the South Carolina Legislature advocated measures similar to those which had doomed most of the textile industry in New England.

Amazing progress began in South Carolina. Thousands upon thousands of good new jobs were created, nearly every type of business flourished as a result, great increases occurred in government revenues, affording the rapid advancement we have enjoyed in educational facilities and other public services of value.

All of this was the answer of industry to a state which had proved itself sound after having so barely escaped an industrial development quarantine.

How may South Carolina continue to progress?

It seems very clear that much of the answer lies in the hands of you young men who will be the future leaders in this state. It cannot be emphasized too strongly, however, that with the opportunities you have come also the large responsibilities of advancing not only the industry itself, but of helping to maintain the healthy atmosphere which the people of the textile communities and elsewhere in this state are now experiencing.

As we enumerated earlier the mistakes of New England, let us now list what the young men of South Carolina can do to prevent what could happen here as it did up there:

1—In addition to doing your job every day, be alert, active and informed citizens; read up and broaden yourself on subjects other than just your job; know what is going on in your community, state and nation; learn from the mistakes of the past; do something about it by constant participation in good government; recognize and fight radical ideas; never surrender the proven principles of sound competitive industry, and draw a sharp dividing line between private business and government interference.

2—Help those who work with you to understand that wages must be compensated for by a fair return of productive work.

3—Continue day by day to remind yourself, your community and your state of the absolute necessity of sound and balanced attitudes in all phases of human well being.

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BOSTON NEW YORK

WORK AT U. S. D. A. COTTON LABORATORY

(Continued from page twelve)

quality of a product made from cotton. The Standards have been a great help in measuring cotton quality.

In order to obtain additional test data on small quantities of cotton, a small sample slasher was designed and constructed so that as little as 2 pounds of yarn can now be prepared and woven into fabric for strength testing and dyeing.

COTTON TESTING SERVICE AVAILABLE TO BREEDERS AND OTHERS

To make the testing experience of USDA laboratories available to cotton breeders and others, an Act of Congress, passed in April 1941, provides for the making of fiber and spinning tests on a fee basis. The special equipment needed for much of the testing work and the high degree of skill required for accurate and dependable results have made it necessary to provide a certain degree of specialization at the various laboratories. The cotton testing services available at the various laboratories are as follows:

1. All laboratories:
   Fiber length by the fibrograph, fiber strength by the Pressley tester, fiber fineness by the Micronaire, fiber maturity by the Micro-projector method, and moisture content by the drying oven method.
2. Clemson, S. C., laboratory:
   Carded and combed yarn spinning tests, plied yarn and cord tests, Shirley Analyzer test, fabric weaving and testing, fiber length, fiber fineness and maturity by the array method, in addition to fiber tests which are performed at all laboratories.
3. College Station, Tex., laboratory:
   Carded yarn spinning tests, plied yarn and cord tests, Shirley Analyzer test, fabric tests, fiber length, fineness and maturity by the array method, in addition to fiber tests which are performed at all laboratories.
4. Mesilla Park, N. Mex., laboratory:
   Ginning of test samples, determination of foreign matter content of unginned cotton samples by the fractionation method, and Shirley Analyzer tests, in addition to the fiber tests which are performed in common at all laboratories.
5. Stoneville, Miss., laboratory:
   Ginning of test samples, determination of foreign matter content of unginned cotton samples by the fractionation method, and Shirley Analyzer tests, in addition to the fiber tests which are performed in common at all laboratories.
6. Washington, D. C., laboratory:
   All fiber cross-section, grade and staple classification, causticaire tests for fiber fineness and maturity, fiber length, fineness and maturity by the array method, in addition to the fiber tests which are performed in common at all laboratories.

Cotton breeders have been quick to use these services in evaluating the qualities of their selections, progenies, and new strains as a means of ascertaining promising selections. This has accelerated the progress made by American cotton breeders in developing cottons characterized by improved spinning quality. Many mills are taking advantage of the laboratory services to guide them in some of their purchases of cotton and to test their manufacturing levels to ascertain whether changes should be made.

A program of testing cottons of representative varieties grown by selected cotton improvement groups across the Cotton Belt was initiated in 1946. Samples representative of the predominating grade and staple length for early, midseason, and late-season lots, embracing a considerable number of bale samples composited for fiber and spinning tests, are carefully selected each year. The results are published periodically during the season concurrently with the crop movement.

THE TEXTILE SCHOOL TAKES TO THE AIR

The faculty of the School of Textiles of Clemson College, through the courtesy of the Clemson Journal and in coordination with J. B. (Bob) Mattison, moderator of this program, "takes to the air waves" each Wednesday on the 12:45 - 1:00 program for the next 52 weeks over WIS, broadcasting "state wide" at 560 on your dial. These are general programs and should be of interest to the public as a whole. A committee of four faculty members was appointed for the purpose of arranging these programs, Professors J. L. Thompson, R. J. Breazeale, and R. G. Carson with J. C. Hubbard, Jr, as Chairman.

J. C. HUBBARD

Prof. Gaston Gage, outstanding member of the faculty known to all the graduates of the Textile School, gave an excellent start to the first program, taking the cotton from the grower to the mill. He covered the handling of cotton by the ginner, through the local buyer, to those who classify the cotton as to staple and class, and to those who resell to a mill which desires a specific type of cotton. The second program by Prof. J. C. Hubbard, Jr., covered the progress of the textile industry in the South, South Carolina in particular, for the past century. The third talk in the current series was given by Dr. R. G. Carson. The job location and placement of students was discussed rather extensively endeavoring to give some idea as to types of jobs available in the textile

(continued on page twenty-four)

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Gerrish Millikin Mill: Ralph D. Simpson, ’33, Overseer; J. C. Shell, Jr., ’38, Ass’t. Plant Superintendent; C. M. O’Shields, ’42, Second Hand; C. A. Murchison, Jr., ’44, Industrial Engineer; B. T. McDowell, ’46, Overseer; Clyde O. Long, ’48, Junior Industrial Engineer; Herman E. Bright, ’50, Overseer; J. W. Miller, ’50, Time Study; U. V. Moore, ’50, Loom Fixer; R. B. Graham, ’51, Trainee; T. L. Yelton, ’52, Second Hand; E. J. Gilliland, ’53, Trainee; W. B. Mullinax, ‘53, Trainee; S. E. Whitten, Jr., ’29, General—Preparation; Fred H. Antony, ’38, Office Manager; H. E. Lee, Jr., ’49, Plant Engineer; W. H. Moore, ’49, Overseer; J. C. Clanton, ’51, Production Control Ass’t.; W. Y. Watkins, ‘53, Personnel Ass’t.

Joanna Cotton Mills: J. K. Waits, ’47, Head of Standards Department; F. H. Simpson, ’51, Laboratory Director; R. A. Bridges, ’51, Industrial Engineer; L. A. Crawford, ’47, Ass’t. Superintendent; W. W. Niven, Jr., ’36, Cost Accountant; H. M. Hunter, ’28, Pay Master; J. E. Willingham, ’46, Industrial Engineer Trainee.

Johnston Mill: H. S. Ackis, ’41, Ass’t. Overseer; F. D. Hill, Jr., ’50, Industrial Engineer; H. B. Knox, ’40, Ass’t. Plant Superintendent; H. E. Thompson, ’49, Ass’t. Designer; E. W. Clark, ’52, Junior Industrial Engineer; T. E. Peden, ’38, Plant Superintendent.

Laurens Mills: T. C. Hunt, ’32, Plant Engineer; A. T. Wilbanks, ’49, Supervisor of Planning Department; T. L. Timmerman, ’43, Laboratory Technician; J. W. Armstrong, ’48, Second Hand; J. E. Koopman, ’48, Second Hand; C. W. Patterson, ’50, Second Hand; F. W. Adams, 52, Fixer; W. H. Walker, ’52, Fixer; J. L. O’Shields, ’53, Trainee.

Victor Monaghan Co.: L. A. Knight, ’50, Waste Control; J. J. Nipper, ’49, General Overseer; W. M. Poog, ’50, Ass’t. Overseer; D. A. Stansell, Jr., ’44, General Overseer; C. D. Stradling, ’48, Technical Advisor; F. L. Thackston, ’50, Secretary to the Manager; P. J. White, ’49, Plant Superintendent.

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Excelsior Finishing Plant: Harold O. Bryant, ’51, Second Hand; Jereme Wilson, Jr., ’49, Second Hand; Joe E. Fendley, Jr., ’50, Second Hand; Charles R. Hatcher, ’53, Supervisory Trainee; Robert E. Pruitt, Second Hand; Marvin Alexander, Second Hand; James L. Heaton, ’49, Overseer; Edward S. Olson, ’38, Research Engineer; Robert E. Christenberry, ’48, Production Control Supervisor; Milton P. Blanchett, Jr., ’48, Overseer; Bennett M. Keasler, ’49, Overseer; Roy H. Boggs, ’50, Overseer; Philip H. Rosenbery, ’44, Joe G. Farrell, Jr., ’48, Manager of Production Control; James H. Willard, Foreman; Henry S. Ehrhardt, ’51, Research Engineer; John P. Carwile, ’49, Assistant Chemist; Robt. M. Hoffman, ’50, Assistant Chemist; George G. Konduros, ’43, Production Analyst; Thomas E. Moore, Second Hand; Robert L. Keasler, ’51, Second Hand; Addison B. Carwile, Jr., ’48, Cost Accounting; Benson C. McWhite, ’44, Superintendent; James C. Harper, Sample Department; Dean Davis, ’48, Laboratory Technician; Frederick Duncan, Laboratory Technician; Robert L. Bowen, Finishing Department; Gamewell S. Keasler, Section Hand; Thomas B. Tate, Open Tenter Helper; James C. Wallace, Synthetic Department; O. Kendall Drake, ’52, Supervisory Trainee.

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THE TEXTILE SCHOOL TAKES TO THE AIR

(continued from page twenty-one)

industry as well as the possibility and future of these jobs, and requirements necessary for the student to fulfill the job.

Future programs are planned to cover the use of soaps and detergents in launderings as well as the use and launderability of synthetic fibers in present day garment manufacture. Others will cover "Textiles as a Career," "Sewing Thread Production" and additional topics of interest to the farmer, housewife, textile executive, and prospective student alike.

At present this is a live program not only from the view point that the program originates here on the Clemson College campus and goes directly on the air from the studio located here at the Clemson House, but also the topics are of today, for today. Plans are now being made to send these programs by tape under the name, "The Voice of Clemson" to stations at Greenwood, Orangeburg, Charleston, Sumter, Florence and WMIT at Mount Mitchell. Other programs will be transcribed and sent to thirty additional stations throughout South Carolina.

The idea behind these programs is to bring to the attention of the people of South Carolina some of the activities carried on here at the Textile School.

RAMIE

(continued from page nineteen)

ache. During the first year's growth, the plant reaches a heighth of about one foot. During the second year, the plant must be cut twice, and after two years, it must be cut three times a year. It has been said that you can cut the plant at night and by morning it will be several inches high. One of the main advantages of ramie is the fact that it does grow fast. To grow it must have food, therefore, it uses the food from the soil very fast and this must be replaced in the form of fertilizer. If the roots are not controlled, they will be too thick to grow after eight years. In fact, the ground will be a solid mass of roots and fertilizer will not help any more.

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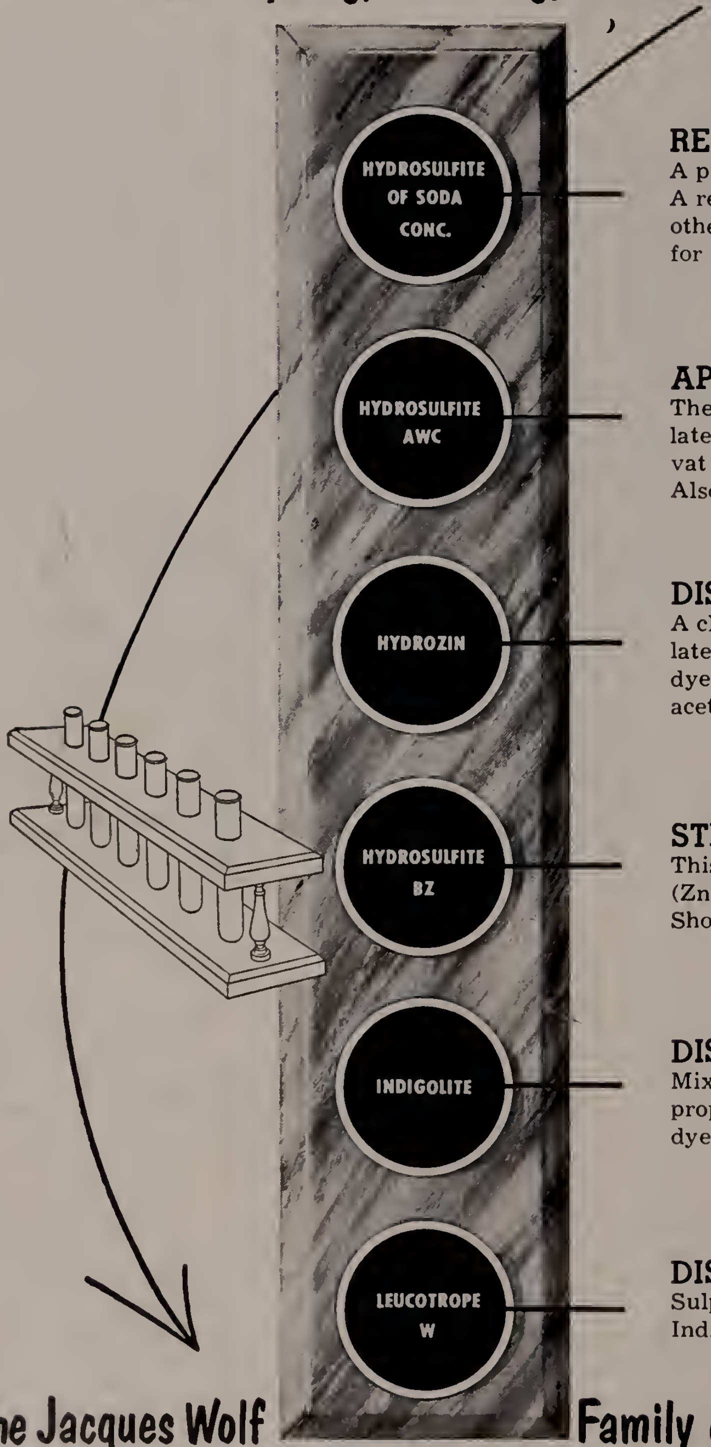

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STUDENT PUBLICATION OF THE CLEMSON TEXTILE SCHOOL

. 2 DECEMBER 1953 Vol. 12

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THE

Bobbin and Beaker

Official Student Publication
Clemson Textile School

Vol. 12 DECEMBER 1953 No. 2

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THE COVER

The three lovely young ladies pictured on the cover won top honors in the South Carolina maid of Cotton contest held at Clemson recently. Miss Barbara Cates of Spartanburg, is the South Carolina Maid of Cotton of 1954. Miss Cates is shown with Miss Alice Rustin of Columbia (right) first alternate; and Miss Anne Evans of Camden, (left) second alternate. Miss Cates will compete for the national title in Memphis, Tennessee, in January.

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THE BOBBIN AND BEAKER. Organized in November, 1939, by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge four times during the school year by students of the Clemson College School of Textiles. All Rights Reserved.

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The views and opinions expressed in all guest articles are those of the writers themselves, and must not be construed to necessarily represent the views and opinions of the Editors of this magazine or of the Faculty of the Clemson College School of Textiles.

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OPPORTUNITIES IN THE TEXTILE INDUSTRY

Jay Earle Garvin

A veteran of 17 years' service with Burlington Mills, Jay Earl Garvin is a vice president in charge of the Company's filament box loom throwing and weaving operations.

Garvin came to Burlington in 1936 from Kings Mountain, where he had served as general superintendent of the Dilling Cotton and Rayon Mills from 1933 to 1936. After joining the Burlington organization, he was manager of the Altavista (Va.) Rayon Plant from 1937 to 1945. In 1946 he was moved to the executive offices in Greensboro. Garvin was elected a vice president in 1949.

A native of Pendleton, S. C., the textile executive did his first apprentice work there in a small cotton mill during the summer months while taking a textile course at Clemson College. In 1918 he left school to volunteer for military service in World War I, returning to Clemson after the war to graduate in 1920.

In September 1920, the young textile graduate became a designer for the Brogon Mills, now the Appleton Company of Anderson, S. C. Four years later he left to join the Judson Mills, Greenville, S. C., where he worked in various capacities until promoted to assistant superintendent in 1929. In 1930 he returned to Anderson as general superintendent of two Gossett Mill plants where he introduced the first rayon weaving there. In 1933 he moved to Kings Mountain for his work with the Dilling organization.

Recently a slight decline has been noted in enrollment at textile schools throughout the country. This is disturbing to those of us in the industry who are in position to see that opportunities in the textile field are greater today than ever before.

Actually the textile industry is just scratching the surface of a major revolution which began less than 25 years ago with the introduction of chemical fibers to textile manufacturing.

Today that revolution is in full swing, and bids fair to continue for many years to come, with horizons of unlimited opportunity for the young men of today who choose that field in which to seek their careers.

In every field of American industry, more new developments are pending in laboratories and research departments than ever before. In any industry you might examine you will find new ideas in the making that are calculated to bring greater comfort and convenience to man at lower costs than ever before in history.

This is every bit as true,—if not more so,—in textiles as in any other industry. Right now by conservative estimate there are at least ten new fibers emerging, or ready to emerge, from the chemists' test tubes. Many of these will prove far superior to anything yet offered to the public. And, along with the many new uses and applications that are constantly being found for the established natural fibers, they promise entire new areas of development and use for textile products.

Because of its highly competitive nature, the textile industry places a far higher premium on initiative and ability than less competitive fields. There are in textiles enormous opportunities for the individual to stake out a claim for himself in creative styling, in original fabric construction, and in effective merchandising.

Some young men striving to choose a career have perhaps been coaxed away from textiles by the lure of bigger starting salaries held out by some other industries. A chemical company working on a huge high-priority defense project, for example, can obviously afford to offer higher salaries to young men just starting out. But a closer look will show that in the long range prospect, the man entering textiles may fare better. Studies have shown that despite higher starting salaries in many such industries, advancement afterwards is often slow. Frequently the man in textiles after a few years will be doing considerably better salary-wise and in scope of responsibility than those who may have chosen higher beginning salaries elsewhere. **Fortune** magazine just recently made an exhaustive survey which showed that salaries of top personnel in the textile industry rank near the top of the list, while at the same time the average age of top textile executives is younger than that of other industries.

Another fact that we in the industry believe to be of especial significance today is the necessity for a well-rounded knowledge of textiles rather than a highly specialized knowledge of one phase.

The day of the salesman who knows nothing of manufacturing, or the mill superintendent who is entirely unfamiliar with merchandising methods and practices, is past. The young man seeking a career in textiles must have some knowledge of all phases of the industry. The development of new fibers and blends, new end uses, new manufacturing techniques, and a generally closer integration within the industry have brought merchandising and manufacturing closer together. And today, in order to be an outstanding success in merchandising, the salesman must have a broad understanding of manufacturing processes. Similarly, the mill superintendent or manufacturing executive must likewise be familiar with and keep abreast of new sales methods and techniques.

To that end, many of us in the industry have recognized the need for inclusion of courses in textile marketing, merchandising and distribution in the curricula of our southern textile schools. The availability of such courses could mean much to the young man who realizes while still in college that he has qualifications that would particularly fit him for selling — they could help him that much farther along the road to a successful selling career.

In summary then, I should like to emphasize once again that opportunities in the industrial world — and particularly in textiles—are unlimited. Authorities at textile and other technical schools will have far more calls for trained graduates next spring than they will be able to fill. And this demand for skills of trained Americans is increasing over the world—because of the unique know-how in techniques of productivity that have been developed in this country.

So, contrary to skeptics who would have us believe that the frontiers are all explored, the fortunes all made, or the substantial businesses all built up—just the opposite is true: the surface has hardly been scratched.

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Industrial Engineering, A Management Tool

Dr. R. G. Carson, Jr., Associate Professor of Textiles
Textile Management Department

Dr. Carson is a graduate of Clemson, receiving his B.S. in Weaving and Designing in 1939. Since then, he has done graduate work at Georgia Tech where he earned his M.S. in Industrial Engineering in 1950, and in 1953, received his Ph.D. in Industrial Engineering from Michigan State.

There is a feeling among some textile plant managers that staff or auxiliary departments are so much window dressing—"These departments don't really help produce the goods, they just add to the overhead." At the first sign of a drop in the market, the manager looks around for some place to cut expenses. As a consequence of his feeling that only line management really counts, such departments as the Industrial Engineering, Research and Development, Personnel, and Quality Control are either entirely or are sharply curtailed. Nothing could be more short sighted. These departments should pay for themselves at any level of prosperity, but especially so at a time when management is cutting every corner and watching every penny.

Management is sometimes misled by the fact that the ratio of overhead to direct labor cost is higher now than ever before, and getting higher all the time. The continual increase in technology that results in more automatic machines, more pounds per spindle or loom hour, and more pounds per operator hour tends to reduce direct labor cost per pound. Thus, if overhead stays constant, the ratio of overhead to direct labor will increase, and if overhead increases, because we have more technicians on the monthly payroll, then the ratio will increase even more

Industrial Engineering is one of these staff departments that add to the overhead. Industrial Engineering is a valuable tool for management; and a tool that should pay for itself in good times and bad, else it has no reason for existence. Industrial Engineering is not alone for the big plant or chain of mills; it is a tool for all big and little alike, regardless of product.

Let's examine some of the uses of this management tool.

1. Set work loads, using the most accurate information obtainable. This might include stop watch time studies, fundamental motion time systems, like Methods Time Measurement or Basic Time Study, or even accumulated production data. The plants' own Industrial Engineering department should be able to set most of the work loads, but outside help may be necessary occasionally to take care of major plant changes or to train plant personnel initially in the techniques of work load determination.

The establishment of standards of operation is a necessary preliminary to setting intelligent work loads and quality control standards, so it need not be considered separately.

The alternative to having work loads set by trained personnel is to set them by guess, or have the overseer set them by his guess. Example: "We know from years of experience that a man can take care of about 25 looms stops per hour, so we keep juggling our assignments until we get one that size."

2. Spearhead the work simplication program. Better methods result in more production with no increase of effort on the part of the operator. These things don't happen spontaneously however, someone has to show supervisors and key personnel how to do their own simplication. Some one has to awaken their imagination and their thinking. Some one has to follow up and give expert assistance to people in working out their improved methods. The natural stimulus is the Industrial Engineering Department.

(continued on page fifteen)

Activities of the American Cotton Manufacturers Institute, Inc., at Clemson, S. C.

John T. Wigington, Director
The Division of Technical Service

The American Cotton Manufacturers Institute, which is the central trade association serving the nation's textile industry and representing spinning, bleaching, finishing and allied plants, both small and large, all over America, maintains in the textile school at Clemson its Division of Technical Service which includes a modern cotton fiber testing laboratory.

The Division of Technical Service was established at Clemson in 1941 under the Cotton Textile Institute and taken over by The Cotton Manufacturers Institute in 1949. The activities of the Division are divided into two separate classifications. One of these services covering the entire membership and the other available to interested members on a fee basis.

The service covering the entire membership includes the handling of requests for technical information, the distribution of technical reports and the attendance at important textile research conferences and meetings.

The Institute's cotton fiber testing laboratory serves two functions. First, it makes available to the mills a laboratory for the training of their technicians in all the techniques of cotton fiber testing. Incidentally, this is the only laboratory of this type in the United States. Second, it affords the mills a place to have their cottons tested. These activities are offered to all American Cotton Manufacturers Institute members, to cotton breeders, producers, ginners and merchants.

The training program and the cotton fiber testing work is under the supervision of Helen G. Beasley, fiber technologist of the Institute. This program, which was initiated during the summer of 1944, has proven popular with all branches of the cotton industry. During this almost ten-year period mills controlling better than thirty-five percent of the spindles in place in this country today have had technologists trained in this laboratory. Cotton breeders and cotton merchants have also sent their technologists to the Institute's laboratory for the regular courses and for special training.

The Institute's main office is located in Charlotte, North Carolina. Offices are maintained in Washington, D. C., and New York, N. Y., along with the one at Clemson.

The president of the Institute is always an operating executive of a manufacturing plant. H. K. Hallett, of Charlotte, N. C., who is vice-president and general manager of Kendall Mills is the present president. Robert C. Jackson of Washington, D. C., is the executive vice-president and F. S. Love, of Charlotte, North Carolina is the secretary and treasurer.

ACMI CLASS IN COTTON FIBER TESTING

Reading from left to right: Olin Dunn, Macfadden Bros. Co., Memphis, Tenn.; Helip Padula, Bolsa De Mercadorias De Sao Paulo, Brazil; Mrs. Leah Eller, W. M. Hall & Sons, Belmont, N. C.; William F. Ashby, Textiles Inc., Gastonia, N. C.; Richard C. Douglass, Spool Cotton Co., Research Laboratory, Newark, N. J.; Mrs. Helen G. Beasley, The American Cotton Manufacturers Institute, Inc., Clemson, S. C.; Ted Putman, LaFrance Industries, Pendleton, S. C.

RAYON WARPER CREEL CONE HOLDER PATCHES

Mills having trouble with sheepskin patches not sticking to iron cone holders in horizontal creels may correct this difficulty by using cotton jersey slip covers on cone holders as a base to glue patches. The Clemson Textile School has been using this method for several years and have experienced no further difficulty with patches falling over or failing to stick to iron cone holders.

The Human Side

Prof. John L. Thompson
Carding and Spinning Department

During these hurried times of complex industries with their multitude of statistics, labor laws, policies, and productive procedures, it behooves us to pause for a moment to consider the human side of things.

There is not a single day that passes during which management does not deal with the problems of better quality, lower costs, less waste, increased production, etc. Management is looking for the young men with the qualifications to solve these problems for industry. The basic fundamentals for a beginning to the solution of these problems comes from the training programs carried out by the industries, and the years of actual experience to follow on the job. An industry's success is measured largely by its profits through high productivity of quality products at lower costs. Can our young men of today contribute to these successes?

Yes, our young men can contribute to an industry's success if they approach the tasks via the human side. They will have to become convinced that their industry's success is gained through the people on the job and not merely by the supervisor in charge These people are the **production;** the **quality;** the **lower costs.** It is all there within them; it is the supervisor's task to see that they give forth willingly and freely; for only through their whole-hearted cooperation will the supervisor be able to acclaim this success. An industry is made up of the countless hundreds who keep the wheels turning that produce the goods that produce the profits. These people are human beings and all they ask of those who supervise is to be treated as such. The average worker takes pride in producing a better than average product. He will produce a superior product if somewhere along the way the supervisor will say, "John, we appreciate the effort you are putting forth to help our company stay on top." Most of us are quick to criticize; slow to praise.

You hear people say, "John Doe isn't interested in costs." He might be more interested if his supervisor had taken more time to develop a cost-consciousness in his employees. The average worker is interested in costs. His whole life revolves around such basic facts as how much money he will make and just how much he will have left over when all his bills are paid. All a supervisor has to get across to the employee is that there is a direct relationship between controlling the company's costs and the worker's own security. This can be done through frank and direct discussions of cost problems. Make the worker feel a part of things; it is **his** efforts that will reduce costs. Above all, the supervisor should show interest in costs through his own actions.

A production increase can be obtained by either stepping up the present routine or by improving the job method. Here again the worker becomes involved. Very few employees care to have additional burdens added to their daily routine; nor are they overjoyed by abrupt departures from the normal. The more logical approach to the increased production is to improve upon the present method. There is always a certain amount of resistance from the worker when such a change is to occur. Remember that he is only human — wouldn't you feel the same if you were in his shoes? These production problems must be discussed with the employees so that each person may understand his part. Give credit to the worker for his suggestions. He will be more than willing to cooperate if he feels that his was the suggestion that helped solve the problem.

The young men graduating from our institutions today will become tomorrow's supervisors of industry. Their trees of knowledge are fundamental, and the degree to which they develop depends upon their application of these fundamentals to the practical problems they will encounter in their daily tasks. It must be remembered, however, that few of these problems will be solved without an insight into human nature; for it is the human element that is the heart of the industry! These young men should begin to develop a social consciousness, while still a student, which can be broadened by their actual experiences from contacts with people later on in industry. Their degree of success and that of their industries depends largely upon their understanding of human desires, emotions, convictions, and human behaviour under varying conditions.

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The Textile School Takes to the Air

Prof. J. C. Hubbard, Jr.
Weaving and Designing Department

Since the last publication of the BOBBIN and BEAKER, the faculty of the School of Textiles Clemson College, has taken to the "air waves" seven times. This is a live program, as previously stated, and may be received over WIS, 560 on your dial each Wednesday from 12:45 until 1 o'clock as part of the Clemson Journal, with our genial host, Bob Mattison as moderator. In addition to the live program it is taped for transcription and is used by 29 radio stations throughout the state. Also a four minute "Voice of Clemson" condensation of these programs is sent to and used by Greenwood, Orangeburg, Florence, Easley two stations in Charleston, and Sumter and WMIT, Mount Mitchell FM which covers seven states.

On October 28, Prof. H. B. Wilson, of the Yarn Manufacturing Department, had as his guests the Burmese students, Maung M. Aye, Maung K. Si, and Maung M. Than, attending the Textile School here at Clemson. These students are about as far away from home as any student can possibly get. It was interesting to note that these students are sent to school by the Burmese Government and the Washington Embassy of their government chose Clemson as "the textile school" for them to attend.

Prof. L. Hugh Jameson, of the Weaving and Designing Department, on November 4, discussed the different phases of weaving and other textile manufacturing necessary to convert yarns to fabrics. The interview covered the basic weaves and more complex and intricate weaves for cloth fabrication such as plain weaves, twill and sateen weaves and their derivations, double cloths, bedford cords, piques, velveteens, corduroys, and toweling, not to mention those more intricate fabrics such as drapery material, upholstery fabrics, damask table cloths, figured bed spreads and blankets. These were then broken down as to the type of loom involved in their production such as cam, dobby or jacquard.

To give a well-rounded program, Mr. Roscoe J. Breazeale, Instructor in Textile Chemistry and Dyeing, covered soaps, water and synthetic detergents. Water, as far as cost goes, seems to have some bearing on the location of textile plants where large quantities are used. Not only must the water be suitable for processing textiles but in the South, the winter temperature of water is higher than the North and in the case where it is a question of raising the temperature to 30°C, the difference in the starting point, say 5°C for the North, and 15°C for the South, when a finishing plant uses several million gallons a day, there would be quite a saving on fuel alone by locating this plant in the South.

Prof. James H. Langston, of the Textile Chemistry and Dyeing Department discussed the synthetic fibers. He stated that "All synthetic fibers and yarns are man-made but all man-made yarns and fibers are not synthetic. Some man-made fibers are regenerated cellulose which is not a true synthetic."

It was interesting to note from Prof. Tom Hendrick's talk that cotton sewing thread is not as dated as the textile industry. The first cotton sewing thread mill came into existence during the War of 1812 in Scotland, and was a direct result of Napoleon Bonaparte's Berlin Decree which curtailed the import of silk to Great Britain.

Most cotton sewing thread in the United States is made of imported Egyptian cottons, however, some American Egyptian, Arizona Peeler, and Pima cottons are used. The numbering system is somewhat complex. A three cord, 30's sewing thread is equivalent in weight and diameter or bulk to one strand of 10's yarn; from there on it become more confusing.

In addition to the normal processes of yarn manufacturing the yarn must be further processed. The yarn must be passed through a flame in order to remove the fuzzy ends of fibers that protrude from the main body of the yarn. The yarns are then mercerized, bleached and dyed. It takes approximately six weeks to convert a bale of cotton to spooled yarn.

Textile mills create openings for materials other than cotton, wool and synthetic fibers and yarn. There is, for instance, approximately one ton of starch, either corn, potato or some other type, used per 60 bales of cotton consumed. In South Carolina, in 1953, there were 2,246,000 bales of cotton consumed.

Prof. E. A. LaRoche of the Weaving and Designing Department, covered these markets rather extensively. Among some of the other major items used in the textile industry are waxes and tallows, which are used together with the starch to form a size for the warp yarns; lubricants for the machine involved; chemicals for finishing and dying; leather goods for roll coverings, check straps on looms and belting to drive the machinery; paper, wooden suplies and rubber material. The list is incomplete without electricity and machines.

Of course the foregoing list contains most of the mechanical items but one remains without which no industry could operate, **personnel**. Prof. T. A. Campbell, of the Textile Management Department, discussed "Textiles as a Career for Southern Boys and Girls." In view of the general interest, this talk appears in this issue of THE BOBBIN & BEAKER.

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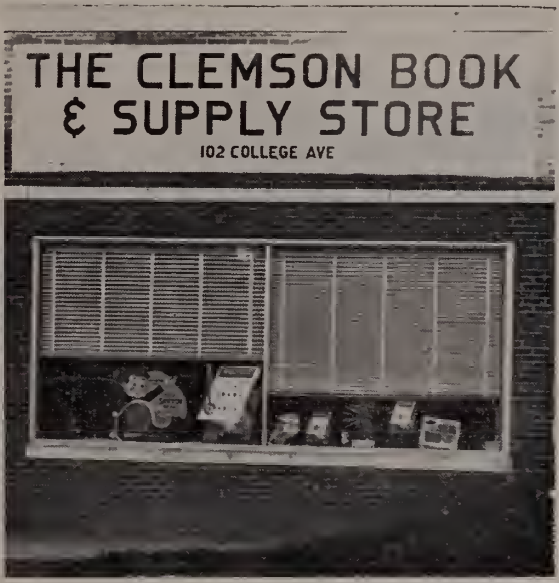

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Textiles as a Career for Southern Boys and Girls

Prof. T. A. Campbell
Textile Management Department

The textile industry is expanding at a rapid pace in the South and more especially in the Carolinas. A young person planning a business career, could select no better environment than the Carolinas. This is home and there are excellent opportunities for the young people who have had good training and possess qualifications required in this progressive and expanding industry.

It is not necessary to have a college education to go into the textile industry, because the mills train, to a certain extent, and the rest is left up to the worker and he can go forward if he shows initiative and interest. One mill manager reports that bright high school graduates can advance faster from learner to a job clasification in textiles than any other industry. The jobs open to the high school graduates after a training period are retail clerks, office assistants, assistant foreman and foreman, warehouse workers, and production operators. One executive advised that 75% of the men occupying managerial positions in his company came up through the ranks. The extent of formal education is very important, but the lack of it is no absolute bar to advancement. Frankly, the person who ends his education with high school handicaps himself, because college education is more usual today than it was a generation ago.

We are fortunate to have three good textile schools in this section of the South: North Carolina State, Raleigh, North Carolina; Georgia School of Technology, Atlanta, Georgia; and Clemson College, Clemson, South Carolina. These schools are well equipped to train the young man or woman in textiles and other courses related to mill work.

Just to give an idea of the scope of job possibilities for the technically trained college graduate, a few are enumerated. Machinery designers, engineers, chemists, accountants, salesmen, stylists and designers, and related activities. Mr. J. H. Sutherland, president of J. P. Stevens & Co., New York says, "There is certainly a challenge ahead to the young technician who finds new ways of creating interest in the old and new fibers, either by the development of new textures, or through the application of novel finishes. Science has moved in, with complex chemistry, physics, precise mechanics, exhaustive merchandising and marketing surveys, accounting and other exacting analyses."

The textile industry employs more women than any other industry and 91% of them are semi-skilled. It can readily be seen that the girls have a definite place in this industry. During the war, women were in the majority in the mills and the mills have not yet fully returned to the pre-war basis when 42% of the mill workers in the North were women, 36% in the South.

Rates of pay are commonly equal for men and women doing the same type of work. Women are preferred for many jobs because of superior patience and dexterity. Girls can expect to be earning an income within a few months higher than possible in any other field requiring similar training. In addition to mill jobs, there are opening for laboratory and designing assistants, clerks, stenographers, telephone operators, receptionists, personnel interviewer, nurses, cafeteria managers and etc. Girls with training beyond high school may find many other opportunities. Women frequently excel in research work and the woman chemist or textile graduate wil find a warm welcome from many mills with salaries and opportunities equaling those of men.

The South Atlantic States have approximately 1700 plants and employ about 485,000 people.

The magnitude of the textile industry is considered in terms of loom and spindles. There are approximately 26,265,000 spinning spindles and 531,000 looms (all kinds) in the United States. 59% of the spindles and 57% of the looms are located in the South Atlantic States. North Carolina, South Carolina and Georgia contain 14,986,000 spinning spindles and 277,000 looms or 96% of the spindles and 91% of the looms in the South Atlantic States.

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A MANAGEMENT TOOL

(Continued from page six)

It can plan and conduct periodic training sessions in work simplification and can go into various parts of the plants to work with the personnel in each department.

The alternative is an almost stagnant situation as far as methods improvement is concerned; the use of only a part of the brains and ingenuity available to the management.

3. Establish wage incentives. Wage incentives are a natural adjunct to measured work loads. The combination should result in lower direct and indirect labor costs. An Industrial Engineer with imigation can work out cost saving wage incentive plans for such unlikely operations as warehousing, stock room, and truck or box car loading.

The alternatives to a sound wage incentive plan are either a dangerous make shift plan or day work; payment for the time put in on a job instead of for the amount of work produced.

4. Set up and administer the job evaluation program. Job evaluation is a program for setting wage levels so that they will be consistent from job to job. It also provides for comparison with the level of wages paid in other plants for selected key jobs. The actual evaluation is done by a committee, made up of people from the Industrial Engineering, Personnel, and Operating Departments. The Industrial department however, should administer the program.

The alternative is wages set by guess, with no assurance that the wages paid on one department are in line with those paid for similar work in other departments, or that skilled jobs are paid commensurately more than unskilled jobs.

5. Set up and maintain a quality control program. This department may become so big that it is separated from the Industrial Engineering department. In either situation it serves the same purpose; to use its technical skills to determine what quality to aim for and keep production at that quality at the lowest possible cost.

Savings can often be made in the amount of testing done, the amount of seconds, produced, the amount of raw material consumed, and the quality of raw material bought. Statistical Quality Control is a help in defining the capabilities of the process or parts of the process under a given set of circumstances.

The alternative to a sound quality control program is quality control by rule of thumb, resulting in inconsistent standards of quality from year to year.

6. Issue weekly and monthly cost reports, showing actual cost compared to standard cost by operations and departments. This type of report makes trouble spots stick out. Only in this way can management exercise "management by exception"; that is, put it's time and effort on those processes that need attention. Such weekly and monthly reports can be expanded to include waste, seconds, labor supplies, and other items that go into the total cost of the product. The essential thing is to have a standard figure, competently set, and an actual figure. Such reports can also be the basis for a supervisory bonus, or for group incentives.

The alternative is for management to dig out its own figures on different processses, decide whether they are excessive or not, and then go after the ones that they think need attention.

7. Make engineering economy studies. When a choice must be made between the purchase of two or more different models of a machine, or between purchasing new equipment and continuing the use of the present equipment, the Industrial Engineering Department makes a complete and thorough study of all alternatives and presents a report based on the results of the study. Such a study includes labor costs, upkeep, depreciation, floor space and overhead requirements, ease of operation, and any other factor that would affect the choice. The best information available is used, not just figures furnished by the manufacturer.

The alternative is to operate on opinion and estimates of salesmen, with results like those of one plant, which discontinued the use of an expensive machine when shown how costs actually compared between doing the operation by hand and doing it by machine. If a thorough study had been made, the machine would not have been bought in the first place.

The Industrial Engineering department is a staff department, not a line department. It does not have authority to hire and fire personnel in the weave room or any other operating department of the company. Its function is technical; to furnish technical know-how and assistance to the plant supervisors. The staff department should advise the plant manager. It should also be on call to furnish technical help to him, or any other line supervisor.

No line supervisor is replaced. The responsibility of the line supervisor to "get out" production in the quantities, of the proper qualities, and at the proper time, is not in the least diminished. However, the line supervisor now has technical aid that he can use to help him run his department in a more efficient manner.

(Continued on next page)

A thorough going program would include some instruction of all supervisors in the fundamentals of all the techniques outlined above. Line supervision in modern management, to properly use the technical help available to it, must be better today than ever before. The Industrial Engineering department, including all the techniques discussed, is no substitution for first class line supervision.

Incidentially, the Industrial Engineering department is often an excellent training ground for supervision. In no other department can the young management trainee get such thorough training in such a wide variety of operations. The Industrial Engineer department is the natural place to look for new line supervisors.

In summary, Management can:

1. Guess at work loads, or measure the work content of jobs.
2. Keep the same methods, or improve them systematically.
3. Use ineffective wage incentives, or have a sound integrated wage incentive program.
4. Guess at the wage level to use, or use job evaluation.
5. Do quality control by rule of thumb, or use modern Statistical Quality Control.
6. Ferret out the weak places by personal examination of all processes, or use management by exception based on weekly and monthly reports showing actual and standard figures.
7. Rely on the advice of the salesman or base decisions on engineering economy studies.

Management can use a good Industrial Engineering Department or it can manage the hard way.

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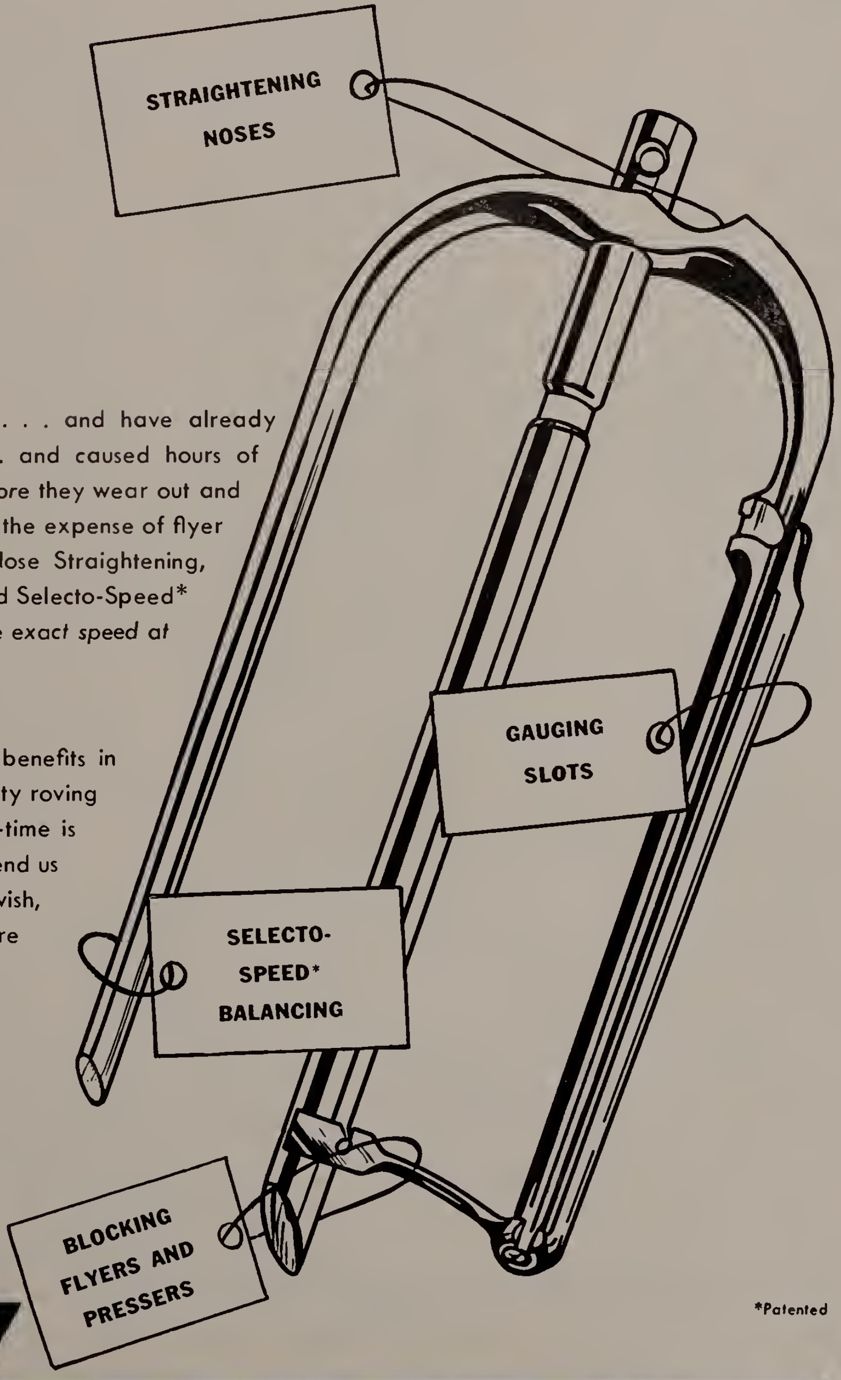

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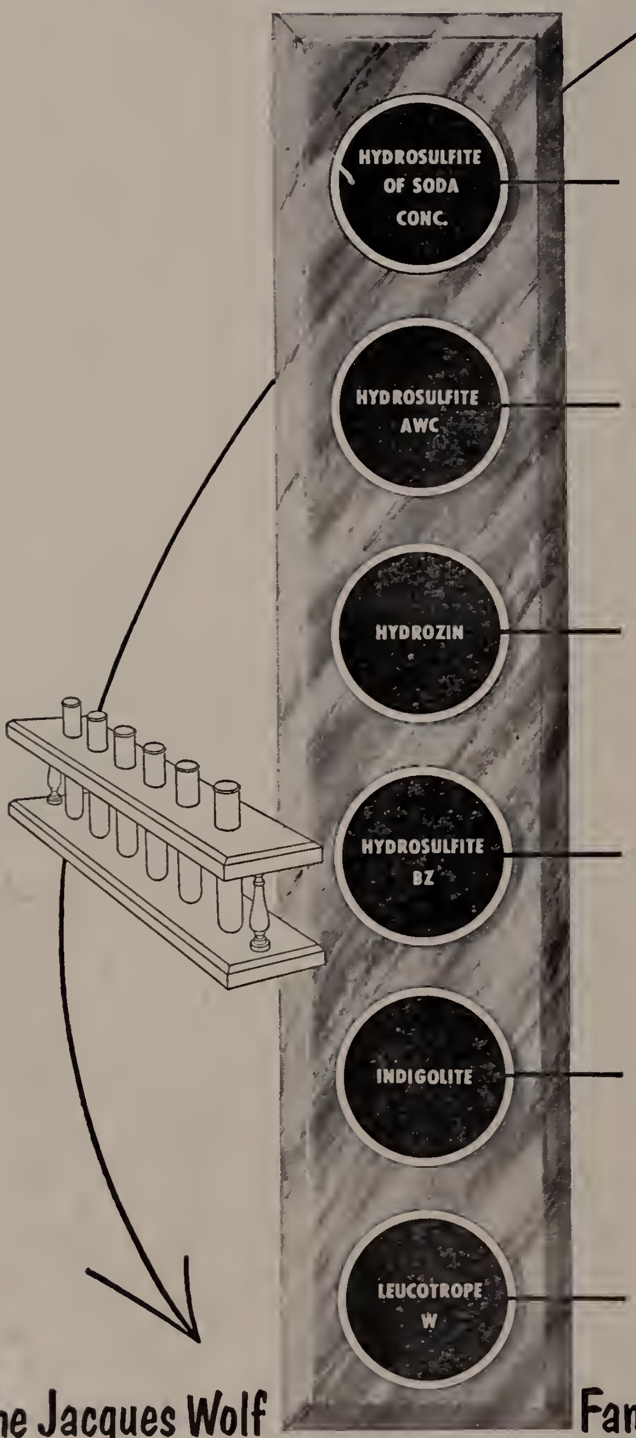

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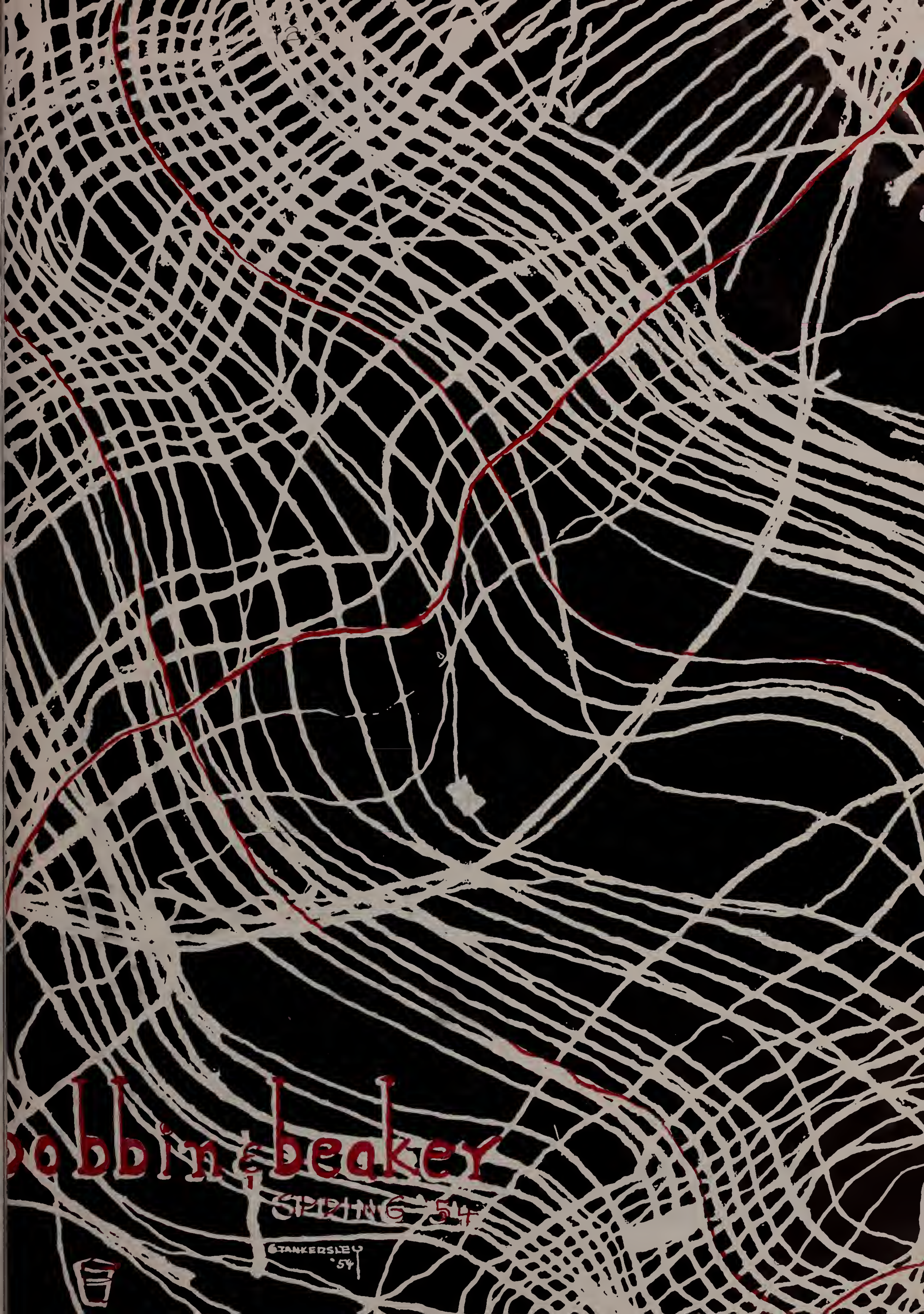
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THE BOBBIN AND BEAKER is a non-profit magazine organized to serve Clemson students and the textile industry. The publishing and circulation costs are financed solely through proceeds received for advertisements. We ask our readers to consider favorably our advertisers when buying.

Clemson Pre-twister for Roving Frames

DR. HUGH M. BROWN
Dean of Textiles

It is not usual that improvements in processing (or in anything else for that matter) can be had at no extra cost, but such seems to be true with a new development at Clemson.

When making roving normally, the strand between the top of the flyer and the front drafting rolls has very low twist. This is due not only to the fact that the final twist in roving is low but that the full twist does not get out of the top of the flyer and travel up the strand to the front rolls. Usually for some distance from the front roll there is practically no twist. Due to the strand passing out through the hole in one side of the top of the flyer it is vibrated back and forth which keeps it whipped slack by stretching it at its weakest places. This effect is especially bad for heavier roving for which the twist is lower and the mass being whipped is higher.

If there were some way of increasing the twist between the top of the flyer and the rolls it would prevent such stretching of the weak places and make better roving. Extra twist in this region would have to be "false twist" and not add any to the final desired twist in the roving.

It happens Clemson has developed a method of adding false twist to yarns to reduce ends down in spinning. The same principle, twisting by rolling the strands, can be used on roving frames. For spinning frames the yarns pass over the edge of rubber rollers mounted in the thread guides and driven by a belt along the side of the frame. (An article on the method is being published in Textile Industries magazine.) Instead of rollers the patents also covered the use of rotating rubber eyes to be built in each thread guide. Now for the roving frame, the method is simplicity itself, since each flyer top is already a rotating eye. Instead of keeping those eyes nicely polished they need only be covered with rubber which by rolling the roving can add as much as several hundred percent extra twist between the flyer and the front rolls. This extra twist is all false and does not follow the strand beyond the top of the flyer. The rubber may be applied in any of the following ways:

1. Place a rubber sleeve around the flyer top with the edge of the sleeve slightly above the metal. This can be nicely done by cementing half-inch pieces of gum rubber tubing around the top of the flyers.

2. The hole in the flyer top may be reamed out and rubber sleeve placed inside projecting slightly above the metal.

3. The top of the flyer may be coated by painting, spraying or dipping with rubber paint. The action is better if the hole is first reamed out to approximately one-half inch in diameter.

4. Rubber coated metal sleeves may be placed over or inserted in the flyer top.

Plans are under way to have special sleeves made by one of the rubber manufacturers.

The operation of the frame is not changed in any particular way. Only the results are different which it seems can be summed up as follows:

1. Much fewer ends down — Fewer splices to affect the yarn.

2. More compact roving and harder bobbins so that more stock can be carried by each bobbin.

3. Possibility of running with less twist hence more production and better spinning.

4. More even roving — Unevenness reduced 20 to 25 percent for heavy roving.

5. Possibility of a practical stop motion due to having firm strands between flyer and rolls.

6. Roving unwinds better at spinning frame and gives more even yarn.

All the above advantages can be had for nothing but the cost of a rubber band or a dab of paint for each spindle.

The method is not as effective on fine roving from high draft frames because it is already given higher twists and being so light the weak places are not stretched by whipping so badly as heavier roving. It is believed there should be some gain, however, and should make stop motions more practical.

A nice way to demonstrate the twist is to run colored roving along with the sliver in a normal end and one with the rubber band. The one with the rubber top will often show more than three times the twist. It was found both at Clemson and in a textile mill that the higher the false twist the greater the improvement in evenness.

Clemson School of Textiles is offering this device to the industry as a service of Clemson and will welcome anyone interested in seeing this simple improvement in operation.

FIBER MICROSCOPY

A Textbook and Laboratory Manual

By A. N. J. HEYN, Professor of Natural and Synthetic Fibers, Clemson Agricultural College, Clemson, South Carolina.

1953. 396 pages, 377 illus., 6 tables. $5.50

INTERSCIENCE PUBLISHERS, INC.
250 FIFTH AVENUE, NEW YORK 1, N. Y.

The material is presented in the form of a standard course, based on the author's experience with textile classes at Clemson. It familiarizes the user with the microscopic appearance of all natural and synthetic fibers commonly used in the United States and with the techniques for their identification and investigation. Microscopy and microchemistry of fibers are developed in a gradual and pedagogical way. Added are a great number of photomicrographs, especially of synthetic fibers, hitherto unpublished.

The user of the manual will be able to analyze and identify any commercial fabric, qualitatively, for its fiber constituents.

Measuring and Reducing Industrial Fatigue

The following is a condensation of an article on measuring and reducing industrial fatigue by Lucien Brouha, M. D., D. Sc., of the Du Pont Company's Haskell Laboratory for Toxicology and Industrial Medicine. It was published in the January issue of **Advance Management** and is presented here with the permission of the editors of that publication.

Years of research have established the fact that increases in an individual's pulse rate and temperature following muscular exertion and the time it takes these reactions to start back toward normal levels can be relied upon to measure the amount of physical stress caused by work and the fatigue it is apt to induce.

While muscular activity is known to result in physiological changes other than increases in pulse rate and body temperature, many of these cannot be used on the job evaluation of fatigue in industry for a variety of reasons, some of them related to the impracticality of making the required measurements outside the laboratory.

But measuring pulse rate and body temperature is technically simple and the equipment required — stopwatches and accurate medical thermometers — is inexpensive and easy to handle and the duration of a single observation may, at the most, be only four minutes.

The procedure which not only serves to measure fatigue inherent in a given set of working conditions, but to evaluate the relationship to fatigue of such factors as age and sex of workers, is essentially as follows:

Immediately following a given work period, the plant physician, whose studies usually are correlated with engineering work-method investigations, records the pulse rate of workers at rest three times, at one-minute intervals. Thus he determines pulse increases caused by exertion and the rates at which the pulse returns towards "resting levels." Body temperatures also are recorded during the same four-minute rest period.

The procedure is repeated through the working shift. If the average rise in pulse and temperature is found to be progressive or if the recovery to the "resting level" too slow at any time during the shift, the physician may be certain that something about the job activity or working conditions is causing employees to draw too heavily upon physical reserves.

Each worker can be considered as owning a "physiological capital" which enables him to have a certain "physiological credit." As he works, he contracts a "physiological debt" which varies with the nature of the job. After the work is over, the greater the debt the longer it will take to pay it back and to recover fully to the physiological resting level. Therefore, any change in the job or in the environment that will reduce the physiological stress will also reduce the debt and the time necessary to recover. Consequently, for the same amount of work, fatigue will decrease.

The reduction in physiological stress can be evaluated by the extent to which heart rates and body temperatures have been found to have been lowered and by the disappearance of high reactions towards the end of the day. The aim is to organize the work so that at the end of the shift the reactions are the same or only slightly higher than they were at the beginning of the day's work.

Examples of reducing the stress and of evaluating the physiological benefit of the change are given in the following:

1. **Reducing the Work Load**

Any body motion is the consequence of the construction of at least two groups of muscles: some which produce the action and the others which control it by antagonist contraction. The final results can be expressed as "mechanical work" in terms of foot pounds. It should be realized, however, that so far, no relation has been established between the mechanical work done and the energy spent by the body to maintain its balance and to accomplish the various motions necessary to produce the mechanical work. In terms of the human machine, what counts is not the mechanical work but the "physiological work" which is necessary to perform a certain movement and which sooner or later will produce fatigue. Nature, speed and rhythm of motion influence the physiological cost according to the number of muscles, which has no direct relation to the mechanical work, is nevertheless costly from the physiological point of view. A simple example of this fact is given by the much more severe fatigue experienced while painting a ceiling with numerous muscles statically contracted than while painting a floor when little static contraction is needed.

Many industrial operations can be made easier if the position of the body (static contraction), the nature of motion (dynamic contraction) and the speed of motion (rate of contraction) are so arranged that the work load is decreased and the physiological cost of the job is reduced to a minimum level. This can be achieved by combining time, motion and physiological studies.

For any job in which the physiological expenditure is great enough to produce significant changes in heart rate, the heart rate recovery curves will determine the physiological cost of the job and will permit evaluation of any modification that is made in

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An Address . .

By

Dr. Ellison S. McKissick, Vice-President
South Carolina Textile Manufacturers Association

We are gathered here today to pay homage to, and present awards to, the champion cotton growers in South Carolina in the year just past. These are the men who have been able to coax the highest yields from a selected five acres, or the winners of the annual South Carolina Five-Acre Cotton Improvement Contest. Somehow it is hard for me to refrain from referring to them as South Carolina's Kings of Cotton for the year. It is, I well realize, somewhat hackneyed and trite always to refer to our staple agricultural commodity here in this part of the country as King Cotton. Here in the cotton belt we have hotels, motels, streets and everything imaginable named King Cotton.

However, it serves the purpose in emphasizing the point I wish to make when I refer to the personification of Dixie's great staple crop as King Cotton—and that is the great cotton heritage we have here in South Carolina. Today, it is estimated, cotton is a way of life for some 14,000,000 Americans — that is, people who are one way or another dependent on cotton for a livelihood. But when you come to think of it, there is no other area in the world where cotton — its culture and its manufacture — plays so important a part in the lives of so many people, in proportion to our size and population at least, than in South Carolina.

Cotton is actually older than recorded history. Man has made use of the plant, which has grown either in tree or shrub form, for thousands of years. In Peru not long ago cotton cloth was found on a mummy estimated to be over five thousand years old. The cloth was a fine fabric of unusual length and still showing good tensile strength. We can well assume that cotton is as old as plant life on this globe, but our cotton heritage here in South Carolina goes back to relatively early Colonial times when the prized and fabulous Sea Island cotton grown on our coast went into fine fabrics for the royalty of Europe and sometimes brought as much as $2.50 a pound.

Our so-called American upland cotton was brought in from Mexico and the same types have been introduced over much of the world after breeding to make them adaptable to the prevailing soil and climate. Of course the boll weevil came and stayed with us by way of Mexico also, and that is why Sea Island can no longer be profitably grown on our coast or elsewhere in the cotton belt. But I am getting a little off the track. I want to remind you that we have always had cotton in our blood here in South Carolina to such an extent that it is small wonder that a South Carolinian, Senator James H. Hammond, on the floor of the United States Senate in 1856, first coined the expression, "Cotton is King."

Cotton, a commodity subject not only to the vagaries of nature but the tide of world trade, is essential to us in normal times and of immense strategic value in time of war. Actually, one can think of no other raw agricultural commodity which has had a greater influence in determining the course of our national existence, our way of life — economically, sociologically, or politically — than this fiber, the most versatile fiber of them all, and the southern part of our country has nearly always, even as now, accounted for about half the world's production.

Yet, in an economic sense, cotton didn't become so important to us until Eli Whitney invented his marvelous cotton gin in 1793. And it is interesting to note, by way of coincidence, that our cotton manufacturing industry in America is considered to have been born in the same year when Samuel Slater built at Pawtucket, R. I., the first cotton mill in the New World using the Arkwright water-powered system of cotton processing which he duplicated from memory, having served as a machinist in the first English mill to be completely equipped with this system.

The cotton manufacturing industry sparked the industrial revolution and mass production in the infant nation that was destined to become the mighiest on the face of the globe, and one whose high living standard is the envy of the world. There certainly would not be time here even to begin to show you the many ways in which cotton has so profoundly influenced the course of modern civilization. I'll cite merely one. And I'll start by asking: To what do our womenfolks owe their great freedom today, their greater education, their political rights, their leisure, their attainment in so many worthwhile fields of endeavor?

What has removed them from 18th Century servitude? The great suffrage movement of a few decades ago, you suggest? To an extent, yes; but Eli Whitney's cotton gin did more to raise the status of our better halves than all the suffrage agitation in the

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Where Are They Now?

By
Fred H. Hope, TM '55

Springs Cotton Mills: Francis L. Bell, '38, office manager; Ernest S. Armstrong, '32, cost accounting; Thomas B. Poole, '50, quality control technician; G. Cleveland Miller, '48, textile engineer.

Springs-Lancaster Plant: A. R. Hamilton, '33, cost department; J. F. Plexico, '24, superintendant carding; C. F. Burns, '33, night superintendent carding; Dorsey Newton, '48, assistant overseer carding; G. W. Gage, '40, superintendent spinning; F. L. Harley, '33, overseer spinning; R. E. Davis, '50, assistant overseer spinning; W. E. Blackmon, '47, assistant overseer spinning; A. B. Tennant, '25, superintendent spooling and warping; R. B. Fulmer, '40, designer weaving; William Leonhirth, '41, assistant overseer weaving; Norman Smith, '48, assistant overseer weaving; F. C. Ramsey, '48, weave overhauling; J. W. Chapman, '51, weave overhauling; D. T. Angley, '51, Supply Foreman; C. H. Crumpton, '48, research department.

Springs-Fort Mill Plant: D. L. Thomas, '24, manager; J. C. Pearce, '30, night superintendent; R. H. King, '43, assistant superintendent; L. O. McKee, '48, overseer spinning; Steven Epps, '49, assistant overseer carding; Vance McGuirt, '49, loom fixer; Manley Young, '35, personnel.

Springs-White Plant: H. P. Walker, '24, superintendent; G. S. Flynn, '49, night superintendent; P. B. Ellis, '47, overseer spinning.

Springs-Gayle Plant: V. A. Ballard, '38, superintendent; C. C. Brigman, Jr., '38, overseer; Emory J. Hollis, '49, assistant overseer.

Springs-Eureka Plant: William Davis Templeton, '43, overseer of spinning.

Springs-Springsteen Plant: Harry M. Miller, '49, assistant overseer of spinning; Joe H. Sanders, '26, superintendent of Springsteen Plant.

Springs-Kershaw Plant: Theron Carter Hegler, '41, assistant to superintendent; Olin Mitchell Clark, '51, supervisor of testing.

Springs-Grace Bleachery: R. S. Stribling, '24, plant manager; James M. Sharp, '25, superintendent of finishing department; Robert M. Hughes, '36, chief chemist; Claude S. Hughey, '43, overseer of dyeing; Richard O. Belue, '44, assistant plant engineer; D. A. Watson, '47, chemist in charge of laboratory; John M. Bridges, Jr., '47, Hooker operator—packing department; Ira E. Estridge, '49, calendar operator—finishing department.

Springs-Research and Quality Control Department: Furman H. Martin, Jr., '33, director of research and quality control; James R. Hunter, '46, laboratory foreman; John H. Blackwell, Jr., '51, laboratory assistant; William L. Grist, '51, laboratory assistant.

Springs-Standards Department: Oren E. Sullivan, '40, key man — Fort Mill; Archie L. Todd, '46, key man — Chester.

Springs-Cotton Department: James B. Elliott, '33, cotton buyer.

Monarch Mills: Thomas D. Truluck, manager, cotton purchasing; William E. Broadwell, assistant to director quality control; Marvin D. Lindsay, manager, waste department; Horace L. Pratt, Jr., superintendent; Ben R. Black, Jr., second hand, weaving department; Harold E. Hulon, trainee, carding department; Woodrow E. Dunn, superintendent; William D. McBee, overseer, spinning department; Laurens E. McAlpine, head of accounting department; Robert L. Whitaker, second hand, weaving department. (Non-graduates): Frank S. Sistare, head cotton classer; Joe F. Shinta, time study engineer; Calvin S. Dobson, time study engineer; John David Hagan, trainee, laboratory.

Riegel Textile Corporation: Walter T. Holliday, '52, assistant to rayon finisher; John C. Thompson, '50, second hand — vat dye; John W. Langford, Jr., '49, personnel assistant; James Baron McNinch, '34, department head, bleachery production and control; Jas. Howard Scott, '52, mill office, production supervisor; Paul B. Skinner, '49, mill cost clerk; Malbourne G. Michael, '51, second hand range; Julian W. Shielry, '46, chemist, Riegel development laboratory; James C. Stone, '43, assistant cost supervisor; Heyward V. Simpson, '41, assistant superintendent—rayon finishing. (Non graduates): Stewart M. Thomson, superintendent rayon finishing; James Parnell, clerk cost department; Jas. A. Scott, assistant overseer, bleach house; Wendell W. Bowenn, overseer, rayon finishing; Thomas G. Moore, assistant plant engineer.

Republic Cotton Mills: Melvin H. Smith, '48, assistant plant superintendent; E. W. Barnett, Jr., '50, shift foreman preparation; Jack Scott, '51, section hand twister; Fred A. Jarrett, '51, clerk, planning department; James T. Cameron, '50, lab technician — dye plant; Grady E. Faulkenberry, '29, superinten-

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STANLEY, NORTH CAROLINA

What Textile Preparatory Machinery Needs Variable Speed Drives and Why

By
Mr. Joseph L. Delaney,
General Superintendent, Joanna Mills

My topic of discussion gives me a great latitude in past, present, and future applications of variable speed drives. I have tried to use some restraint in not venturing into impractical or improbable adaptations of this type drive. In general, my remarks will be confined to the field of textiles in which I am most familiar and which offers a real challenge for variable speed drives.

PICKERS

This machine receives the partially opened stock from the Opener Room. It continues to open it and also to clean it of the heavier impurities, then forms the stock into a thick uniform sheet which is wound into a continuous roll called a 'Lap'. We are concerned only with the forming of the "allegedly" uniform sheet of stock. One yard of lap contains enough cotton to spin from ten to twenty miles of yarn, depending on count. It is axiomatic that to make quality yarn you must start with a lap of high uniformity. The picker evener motion is supposed to regulate this important feature but due to mechanical difficulties requires a terrific amount of maintenance in order to function properly. This motion is as old as a Model T. It is subject to every conceivable ailment of decrepitude. It has too many joints, links, couplings, slides, loose fitted bearings and tie rods. It easily becomes fouled with the lint contained in the air of the average picker room. Its cone section, which increases or decreases the speed of the feed rolls, has a narrow driving belt which has a high slippage factor due to glazing over from dust and lint. This same belt stretches, curls on the sides, and narrows in width, giving slower response to the actuating mechanism and all in all is a complete arrangement for bedeviling the Quality Control Department.

Now here is where a modern variable speed unit controlled electronically and operating in a dust tight casing would really do a job. Such a drive would actually do the work our present eveners are so inadequately performing. This drive would require a minimum of maintenance and give positive control of the feed roll speed. It would have no mechanical linkage to foul, no bearings to stick, no rods to bind, neither slippage, stretching, nor narrowing of its belt. The drive would be powerful enough to handle the load with a high margin of safety. Is there such a drive now available for a picker? No! Is there need of it? Positively!

CARDS

Some time or other all of us have heard about the brand new card evener motion just due to be put on the market. This device would deliver sliver superlatively even, from which smooth, even, strong yarns could be spun. Up to now this is still wishful thinking; but nobody questions the desirability of such a gadget.

Now the card is a rather fine piece of machinery. It does its job well and at a very low cost. Essentially it is pretty much the same today as it was almost a hundred years ago. It takes the picker lap composed of larger tufts of stock, opens these up to the individual fiber, cleans out trash, leaf, etc., drafts the cotton out to a soft untwisted sliver which has two highly contracdictory features. Yard for yard it is very uneven; but inch for inch it has a high uniformity. Over a period of time means have been found to make better picker laps which make better sliver. Better settings, speeds, or components have also improved card sliver uniformity. Up to now nothing has been added to the card which by itself alone corrects a poor lap into a good sliver. If a thick or thin place occurs in the lap it will be made into thick or thin card sliver from which thick or thin yarn will be spun.

It may be that I am somewhat quality conscious, but it is true that quality sliver pays off eventually in lower costs in both spinning and weaving. Such a device as described for use on the picker might be adapted to the card feed roll. Ordinarily, card sliver runs from 10 to 15 perecnt on the Saco-Lowell Sliver Tester. If this figure could be reduced to 5 or 7 percent, then doublings, except for the very fine work, could be eliminated almost, and large size roving would become practically universal. This would pay off handsomely in higher productions and lower costs.

DRAWING

A generation ago serious attempts were made to make more even drawing sliver by inserting a small pair of cones into each delivery of drawing. By

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The Textile School Takes to the Air

By
C. H. Ferguson, T.M. '55

The faculty of the School of Textiles of Clemson College, through the courtesy of the Clemson Journal and in coordination with J. R. (Bob) Mattison, moderator of this program, "takes to the air waves" (dial 560) each Wednesday on the 12:45-1:00 program to bring you the latest news of interest in the textile world, These programs are taped for transcription and used by twenty-nine radio stations throughout the state. Also a four minute "Voice of Clemson," a condensation of these programs, is sent to and used by Greenwood, Orangeburg, Florence, Easley, two stations in Charletson, Sumter and WMIT, and Mount Mitchell FM which covers seven states.

Professor T. D. Efland, Head of the Knitting Department, on December twenty-third, discussed the meanings of different terms used in the knitting industry plus the quality of nylon hose. It is interesting to notice the nylons are not worn out in the sense that we normally think of wear. Professor Efland stated that ninety-nine per cent (99%) of the nylons meet with an accident, such as a sharp fingernail, a splinter on a chair or some other sharp article. "Why don't we make stockings with a larger yarn?" was the next question asked. Professor Efland stated that anyone knows that you must give the customer what she wants and not what she thinks she should have. Hosiery is a fashion accessory to the ladies' costume and is generally purchased as such, and not as a utility item. Nearly all hosiery departments stock heavier denier hosiery which will give greater wear, but they represent a very small percentage of sales.

On January sixth, Professor H. L. Loveless, of the Warp Development Department, discussed the importance of textiles to the American people. According to the statistics of the Bureau of Agricultural Economics, each person in the United States consumes a little over 43 pounds of textile fibers each year based on the average amount of fibers used from 1943 to 1953. This includes all fibers: cotton, rayon, wool, acetate, nylon, etc. Professor Loveless stated that cotton leads all other fibers by making up 32 pounds of the 43 pounds which includes all fibers. In recent years, cotton has increased in per capita consumption but not in proportion to the total. Professor Loveless also pointed out that the United States, while having only 7% of the world population, consumes more than 1/3 of all fibers. It is interesting to note that the year of highest fiber consumption in the United States was in 1942 when war and industry uses played a large rule. The per capita consumption for the year was over 50 pounds per person.

Professor J. C. Hubbard, reported some of the general problems faced by the housewife in caring for textile products. First, Professor Hubbard told the best way to wash chenille bedspreads, housecoats, beach coats, etc., by removing soil or dirt was to place the article in lukewarm water and use a synthetic detergent. While the spread was still wet it was placed into the machine and washed for three or four minutes. It was then rinsed once, keeping the tumble or spin dry at lowest possible speed. The action was watched closely and the fabric removed as soon as the fluffy pile would stand up. It was hung without folding to complete the drying, shaking the spread occasionally. Next, Professor Hubbard talked on Dacron, especially emphasizing its outstanding ability to resist wrinkles and stains, and to retain its shape and crease. After that he pointed out that Orlon-wool, and acetate-Orlon-rayon are the most popular blended fabric on the market at the present time, but as time goes on and fiber production of the man-made increases, it is likely that there may be some changes. Professor Hubbard is an authority on textile fabrics and knows a great deal concerning the care of a fabric.

Professor J. L. Thompson told us the history of cotton and the three groups of cotton on a commercial basis in the world today—(1) Long Staple, which is 1 1/8 inch and longer. Long Staple includes such varieties as Karnak, Sakel, and Pima. These cottons are of a fine character and are used in the finest weaves. (2) American Upland, about 85% of all cotton used is American Upland. (3) Short Staple Cotton, this cotton is of a very inferior quality; consequently only a limited amount is used in this country. The small amount which is used is for mops, stuffing, etc.

Professor W. Bratton Williams emphasized the importance of safety. He pointed out that all accidents fall under three causes: (1) Unsafe conditions; (2) acts of persons; and (3) Acts of GOD. The first two are man-made and make up 98% of all accidents while acts of GOD are responsible for about 2% of our accidents, such as lightning, floods, tornadoes, and over these we have no control. "You have heard

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Reasons for the Large Textile Growth in South Carolina

By

J. L. Richardson, Textile Management Department

As one rides through the state of South Carolina, we see new textile mills by the hundreds and the question asked by some is: "Why are so many mills coming to this state?" The whole thing resolves down to the fact that the textile industry on a whole is a very competitive industry, and as such the mills are forced to locate where the overall cost of manufacturing is lowest.

What, then, are the contributing factors to this low cost of manufacturing in our state? Perhaps the most significant reason may be found in the nature and character of the people of South Carolina. Many textile managers have attributed their success to this factor above all others. The people of South Carolina are over 90% native born. They are individual thinkers and do not require someone else to do their thinking for them, they are free from the false ideals or "isms" which plague so many groups in America today. The people welcome new industry, because they realize that the more industrial jobs we have means more wages and a better standard of living. In exchange they feel they should give a good day's work for a good day's pay. As a result their high productivity has caused many a new plant to succeed from the start. This is verified by the Dunn and Bradstreet Magazine's tabulation of business failures in the United States for the year 1950. Business failures in the United States run 34.3 per 10,000 businesses, and in South Carolina it was 4.7 per 10,000; **this was the lowest in the nation for that year.** Machines run just as well in other states as they do in our state, it's the people operating these machines that makes the difference. Our people are reasonable and are not out on strike on every disagreement with management. The total man-hours lost due to disputes with management during the fiscal year ending June 30, 1952 was only three ten-thousandth of one percent of the total man hours worked. This is another factor that encourages new mills.

The supply of labor has also been more than adequate at almost any location in the state. About 798,000 people make up the labor force of our state. This plentiful supply of labor is partly due to the mechanization of farms causing thousands of people to seek positions in industry. It is estimated that for every farm job available, 14 persons from farm backgrounds must seek other employment. Coming as they do from small towns and rural areas, the people of South Carolina who seek places in industry are sound thinking, conservative, honest and free from foreign idealogies which have brought turmoil elsewhere. You will notice that many of these textile plants are located in rural districts and draw on the local labor supply. Very seldom do you see a mill village around a plant that has been built in the last ten years. These farm people know the value of hard work, and are eager to give a fair day's work for a fair day's pay. The people are friendly and cooperative with management, because of their high sense of loyalty that is ingrained in their character. As a result, they are highly productive and quick to learn new skills. Almost every plant manager faced with placing a new plant in production has been astounded by the speed with which South Carolinians acquire the skill and technical know-how which make for profitable production. In many instances plants have been brought to full production months ahead of schedule.

South Carolina has also been blessed with many natural resources. The raw cotton that is used in many of our textile plants is grown right here in our state, and as a result much is saved on freight in shipping to the mill. Technical men advise that the use of synthetic fibers are being integrated and blended with cotton and wool. It follows that South Carolina's large forest reserves, and its intelligent renewal program, will be of permanent interest to industry. Some rayon yarns are made from wood, therefore, the raw materials are once more, close to the processing plants. Another natural resource that is extremely important to large plants is the water potential for producing power to run the plants. South Carolina has, through its 36 generating stations, the power necessary to take care of its expanding textile industry. Plans are in the making to take still further advantage of the power potential of our lakes and streams.

Our state government has provided the state with an excellent system of roads. There are 23,138 miles of roads in the state system of which 8,888 miles are in well-marked primary system. Hard surfaced roads in both primary and secondary systems total 14,842 miles. These well-maintained roads are very necessary, for trucking the raw materials to the plant and for transporting finished products to the markets. There are over 250 motor carriers doing business in the state, and a large network of rail lines blanket the state. Also, being a coastal state, we may ship readily by sea.

Another part of our state government plays, is the genuine interest it has shown by cooperating with the textile companies that show interest in locating in South Carolina. Our tax laws are administered by a commission of five members appointed by the Governor, approved by the senate, with staggered terms, so as to avoid sudden changes of personnel and more important, insuring a consistant and conservative administration. Stability of tax policies is a very important advantage to textile executives who are looking far into the future. As an example, general property taxes in one state are 300% more than in the state of South Carolina. This is a substantial difference and shows how interested our state government is in encouraging textile business in our state. South Carolina led the nation in industrial development from 1948-51, and the textile industry accounts for a large percentage of this industrial expansion.

Another thing our state government has done to assist the new mills coming to our state is to set up a Research, Planning and Development Board whose function it is to give assistance to existing industry and assistance to industry seeking a new location. This board provides information on such items as labor supply, transportation, power, water, sites, building and buildings costs and many other such items. This board also cooperates with the county planning and development boards throughout the state.

THE TEXTILE SCHOOL TAKES TO THE AIR

(continued from page 11)

of the three "E's" of safety: Engineering, Enforcement, and Education. You cannot create safety by mechanical guarding or by enforcing rules. You must educate for safety. You must create interest and enthusiasm for safety." This was stated by Professor Williams in his speech.

On February 10, Professor W. T. Rainey spoke of the "handling of textile materials." This "handling" refers to washing, bleaching, and other home processes. To decide whether to use a soap or a detergent you must first consider the use of the product. For instance, there are several sudsless detergents which are better for dishwashers than soap. Then, consider the user, for many people are allergic to some soaps. Soap is insoluble in hard water while detergents are not always affected. They operate efficiently in hard water without waste or formation of curdy material. Bleaching is not a cleansing agent so it does no good where washing shirts with dirty cuffs for example. Cotton may be oxidized if excessive bleaching is used and this cuts down on the wear of the material. It is interesting to note that most grocery store bleaches call for using about five times as much bleach as a power laundery would use for the same amount of clothing.

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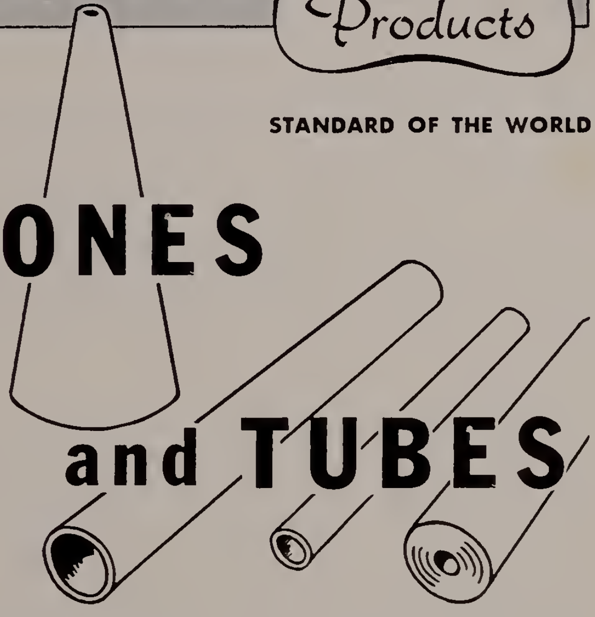

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DEPENDABLE SOURCE OF SUPPLY

MEASURING AND REDUCING INDUSTRIAL FATIGUE

(continued from page 6)

attempting to reduce stress and fatigue. For example, in a job where men had to skim impurities from the surface of a liquid with a long and heavy ladle, the tanks were situated at such height above the floor that the operation had to be performed at shoulder level. Average reactions were high, reaching 160 beats per minute for the first pulse recorded one minute after skimming one tank. Special platforms were built so that the men could operate slightly above waist level. The average heart rate recorded one minute after the operation dropped to 112 beats per minute indicating a drastic reduction in the "physiological work" necessary to perform the job.

A very fatiguing operation can be transformed into a comparatively easy one by total or partial mechanization of the work as well as by improvements in motion and timing. For example, changes in heart rate recovery curves were observed in the same environmental temperature on men doing a job entirely by hand or partially mechanized. In this case the mechanical device eliminated lifting and using a comparatively heavy hammer above shoulder level. Before this improvement a high physiological stress was put upon the workers as indicated by an average recovery pulse of 148 beats per minute measured one minute after the end of a work period. With the new method the average value fell to 110 beats per minute demonstrating that the partial mechanization had resulted in a marked diminution of the stress.

2. Reducing the Heart Load

Considering the effect of increasing environmental temperature on the physiological reactions, it is obvious that reducing the temperature at which the work is done will proportionately lower the reactions. This can be achieved by an adequate ventilation system, by properly insulating the sources of heat, by protecting the workers with screens or special clothing and by developing tools and methods which will enable the man to work as far as possible from the source of the heat.

When humidity enters the picture, adequate ventilation and sufficient air movement will considerably improve the situation. When temperature and humidity were reduced and air movement increased, more favorable heart rate recovery curves were recorded throughout a working shift. At the same time the average body temperature was reduced from 99.0° F., to 98.6° F. Therefore, maintaining temperature and humidity as low as ventilation cost permits, reduces considerably the physiological stress upon the cardiovascular system and the thermo regulating mechanisms of the workers. The final result is less fatigue and greater efficiency.

3. Organizing Adequate Rest Periods

In many instances, particularly in "hot industries," even when mechanization is advanced and temperature has been reasonably controlled, high reactions are still observed among the workers. In such cases adequately organized rest periods provide a reduction of the physiological stress. When the job is scheduled in such a way that the workers take, at set intervals, a rest period which is of long enough duration to insure a complete or nearly complete recovery, they will be able to avoid excessive fatigue and to remain in good physical condition throughout the shift.

Establishing adequate rest periods is not an easy task It has been done patiently, by the method of trial and error and with the close collaboration of the physiologist and the industrial engineer so that changes in rate of work and in production can be evaluated together with changes in physiological reactions. The problem can be illustrated by results of studies made at two average temperature levels with the same group of workers. At an average temperature of about 40° F. with short rest periods between successive operations in the morning and with longer rest periods during the afternoon, the workers were able to perform eleven full cycles of work without showing abnormally high reactions. When the groups were studied in an area where the average environmental temperature was around 82° F., the number of operations was reduced from eleven to eight giving the men longer rest periods. Nevertheless, very high physiological reactions were observed during the second part of the shift indicating a progressive accumulation of fatigue. This shows clearly that at low temperatures the sequence "work-rest periods" was adequately determined to insure high efficiency with a low fatigue level.

At higher temperatures this system did not work. In spite of a considerable reduction in the total work load and in spite of a considerable increase in the rest allowances, physiological reactions were at a high level. The stress became greater as the shift progressed and the men reached a state of extreme fatigue at the end of the day. In this case, in order to maintain both the physiological reactions and efficiency at an acceptable level, another solution had to be found which was to increase substantially air movement in that particular area. Here again the combination of time study and physiological study lead to a satisfactory organization of the day's work.

Duration of rest periods as the shift progresses and as the environmental temperature changes as well as the time intervals between successive rest periods must be accurately determined if a maximum of beneficial results is to be achieved. When an adequate solution is found the reduction of the physiological stress is evident as shown by the lowering of the heart rate and of the body temperature throughout the shift. In relation to this problem it must be remembered that complete recovery is impossible for men who rest in hot surroundings. In certain instances it has been found necessary to air condition the rest rooms in order to insure environmental conditions favorable to a complete and fast recovery of the workers. Such rest rooms have been installed and used for several years in various plants of the Alumnium Company of Canada. The results have been very favorable as illustrated by the comparison of the heart rate recovery curves obtained during the summer on two groups of men doing the same job in the same environmental conditions. One group who took their rest periods in the plant or outside in the shade showed definitely higher reactions both at rest and after work than the men who could rest in air conditioned rooms and could recover to approximately their normal resting level. The temperature maintained in these rest rooms varied with the plant temperature but the humidity was kept at a constantly low level so that the clothing of the men, wet with sweat, dried quickly and made the workers more comfortable, insuring at the same time a good evaporative cooling and a complete return of body temperature to normal levels.

4. Organizing Adequate Teams of Workers

In certain operations where several men are involved, it is sometimes found that, inspite of various improvements, the physiological stress remains too high when the working team comprises the smallest number of men compatible with the job. Under these conditions the only way to bring down the reactions of the workers is to add men to the team. This decreases the individual physical exertion and increases the resting time. Average heart rate recovery curves were obtained for crews of three and four men on the same job. In addition to having a much higher pulse rate, the three man crew also had a higher average body temperature of 99.6° F., as compared to 99.0° F., for the four man crew. The addition of an extra man reduced the physiological stress on the cardiovascular system as well as on the thermoregulating mechanisms. Comparisons of reactions recorded on a comparatively cooler day with the environmental temperature averaging 98° F., with those obtained on a warmer day averaging 115° F., demonstrated that the greater the physiological stress produced by the job and the environment, the greater the improvement achieved by the addition of an extra worker.

5. Influence of Adequate Water and Salt Supply

The importance of an adequate water supply for workers involved in manual labor in hot surroundings has been emphasized repeatedly. In heavy jobs twelve quarts of water or more can be lost through sweating during eight hours of work. In order to avoid excessive fatigue this loss of water must be compensated for as the shift progresses. Drinking must be frequent and sufficient in order to maintain the water metabolism at a normal level on an hourly basis. If the water intake is insufficient, efficiency is reduced and exhaustion soon appears. In practice, drinking will be adequate if an abundant supply of cool, clean and palatable water is available. Frequency distribution curves of body temperatures were recorded for the same job in the same environmental conditions with and without a good water supply. When the supply was inadequate, the water temperature was around 70° F., and the drinking was insufficient to replace the water loss as proved by marked weight reduction in the workers at the end of the shift. High heart rates and body temperatures of 100° F., and above were frequent. With an adequate supply of water maintained at a temperature of 42° F., to 45° F., the drinking became more abundant, water metabolism was more efficiently maintained and body temperatures of 100° F., and more disappeared. At the same time the heart rate recovery curves stabilized at a definitely lower level indicating that the total physiological stress had been appreciably reduced.

Keeping a balance between fluid intake and fluid loss is a matter of training because most people who are sweating profusely will drink about two-thirds of what they eliminate on an hourly basis. If the water balance is to be maintained throughout an eight hour shift one has to drink more than necessary to merely quench his thirst. We have had good results by giving the workers paper cups and explaining to them that in order to replace the amount of sweat lost they should drink an average of so many cups at the end of each work period. The number of cups was experimentally determined by studying the average weight loss of the worker involved in various jobs. The men learned rapidly how to force their water intake in order to compensate more accurately for their sweat loss and a definite improvement in physiological reactions was observed.

In these experiments salt tablets were not used and the salt loss was compensated for by adding enough salt to the food at every meal. It has been shown that the concentration of sodium chloride eliminated in the sweat increases as work is prolonged and as the rate of sweating becomes greater. When a progressive depletion of salt occurs fatigue soon appears and in extreme cases, total exhaustion and heat cramps are observed. Nevertheless, laboratory experiments have shown that the sodium chloride level in blood serum remains remarkably constant in prolonged work in heat provided the overall daily intake of salt with the meals is adequate. Our experience with industrial workers eating a good diet confirms these findings. The men were instructed to salt their food abundantly and no extra source of salt in the form of salt tablets or salted drinks was provided. This practice eliminated completely the gastro-intestinal uneasiness, the stomach cramps and the vomiting which were frequently observed when salt tablets were used. Under the usual circumstances of exposure to industrial labor and heat, it is advantageous to replace the sweat loss on an hourly basis and to replace the sodium chloride simply by salting adequately the daily meals. As proved in many instances, the final results of adequate water and salt intake is to maintain the efficiency and the well being of the workers in spite of very abundant sweating, thus decreasing physiological stress and fatigue.

6. Selection of Workers

The capacity to perform muscular work depends on the natural physical fitness of an individual and on his degree of training for the specific activity in which he is involved. Even when studying men who appear to be thoroughly adapted to their work and to the environmental conditions in which the job is done, wide differences are found among individuals.

The frequency distribution curves of pulse rate and body temperature demonstrate that in order to accomplish the same task some workers experience a much greater physiological stress than others. The upper values of the distribution curves indicate that these men are comparatively "paying too much" for the job and they should be given an easier kind of work. When the "physically unfit" for a given job are eliminated, the remaining group will have a higher efficiency at a lower physiological cost. In many instances the elimination of the poorly fit will have a beneficial effect on the morale of the group because one must remember that a man who is fatigued by his job blames the job rather than himself and influences the attitude of his co-workers. From all points of view it is important to transfer these workers and to use, for comparatively hard jobs, men who can handle them easily.

So far it is only by studying the physiological reactions produced by the job that the qualifications of an individual can be determined. For example, selection of heat resistant workers and a system of gradual adaptation has been used successfully at the City Deep Mine in South Africa. In an experimental chamber equipped with rocks and shovels the new workers are given probationary tests in atmospheres comparable to those encountered in underground work. "Heat intolerant" individuals are detected by excessive increase in pulse rate and body temperature and given no employment in hot jobs. "Heat tolerant" subjects are gradually adapted to their future task in periods of four to fourteen days according to individual tolerance.

Such methods take time and have to be handled with great care in order to avoid antagonizing the workers. Nevertheless, considering the cost of frequent turnover and of continually training new men, and considering the ill effects of chronic fatigue and dis-satisfaction among the workers, the experience is well worth trying in industries where physical exertion and exposure to heat are combined to give a predominant importance to the physiological capacities of the workers.

From the general point of view of labor utilization the lower the physiological stress required by a given task the more people will have the capacities to qualify for it. Therefore, the recruitment of new personnel will be simplified and the employees will be able to continue working at a satisfactory level of efficiency in spite of advancing age. It is obvious that it is in the interest of both management and the workers to see that, by the combined efforts of the industrial engineer and the physiologist, the stress and fatigue produced by the day's work be reduced to a reasonable level.

It has been our experience over the last eight years that when the average value of the first recovery pulse is maintained at about 110 beats per minute or below, no abnormal fatigue is observed as the day progresses. It appears that this level of work can be maintained throughout the shift in a "physiological steady state" provided work and rest periods are adequately organized. The recovery is complete and the physiological measurements taken at rest at the end of the day are within normal limits.

While certain unmeasurable factors are known to cause stress and fatigue in industry, such as emotional stimuli, boredom, social adjustment, etc., certain physical factors leading to fatigue have been measured and their importance evaluated. As a result, we know that industrial fatigue can be reduced with the collaboration of the physiologist, the engineer, management and labor.

WHERE ARE THEY NOW

(continued from page 8)

dent of dyeing; C. Jack Taylor, '48, cost supervisor; G. T. Patton Genet, '50, cost man; Elmer G. Tuttle, '50, cost man; Albert H. Morrison, '50, cost man; W. E. Lindsay, '48, shift foreman No. 1 weave; Allen E. Williams, '47, superintendent; Charles Mundy, '53, card grinder (trainee); Ira G. Garrett, '38, overseer spinning; D. J. Garris, Jr., '49, electric welder.

Pacolet Manufacturing Company: D. W. Walker, '47, supervisor of the standards department; L. F. McMakin, '47, overseer of carding; James H. Harrold, '49, trainee in weaving department; Clarence Lamoreus, '50, trainee in standards department.

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WHAT TEXTILE PREPARATORY MACHINERY NEEDS VARIABLE SPEED DRIVES AND WHY

(continued from page 10)

means of counter balanced feelers, regulation of the amount of stock fed, in relation to the amount delivered, could be maintained. Because of full mechanical operation this application proved impractical and was dropped.

If this old idea could be taken up, given a shot of electronic stimulation, and applied with present day know-how, it might work. Then instead of getting sliver full of variable wave cycles, one would get stock far better than is now considered "normal". One could look forward to seeing cloth free from such defects as wavy filling, thick and thin ends side by side making poor contrast, and poor cover because of yarn unevenness.

ROVING

A roving frame, be it large or small, delivers a thin strand of lightly twisted stock from the steel rolls to the flyer, which winds it on the bobbin. Some method must be used to stabilize the tension on the delivered roving to avoid stretching if too tight, or tangling if too slack. This job is done by a combination of differential motion and top and bottom cones which at all times allows the surface speed of the bobbin to equal the delivery speed of the front roll, by slowing down the bobbin without slowing down any other part of the frame.

This tension, builder, differential compound and cone combination is a fearsome and marvelous get up. It has done a fairly good job over several generations and even in our own day continues to produce a pretty uniform hank of roving. Since I find myself cast as the "man of tomorrow" I'd like to be able to look forward to a device based on the principles of the variable speed drive which would do away with cones and slipping belts, planetary gear compounds, tension racks and gearing, plus all their truck which clutters up the present day roving frame.

It would be "sho-nuff" fine to be able to wind a bobbin of roving as even as the drafting equipment of today is able to produce. Why shouldn't the frame of tomorrow be able to wind a hard, full bobbin of roving made with substantially less twist than conventional and with a correspondingly greater amount of roving on the package. It can be done. I have seen roving made with at least three less teeth of twist than normal and with a gain of at least 20 percent in yardage on the package. From this roving yarn was spun of better than average uniformity and strength. It, also, ran better having less ends down in spinning. It was my understanding that problems in tension were encountered which had not yet been overcome.

SPINNING

For years engineers have known that the operating speed of a spinning frame is a compromise between mechanical conditions at the start of the doff on the empty bobbin as against increased diameter of the bobbin at full doff.

Due to the excessive angle of traveler pull on the empty bobbin, particularly on modern large size rings, end breakage is considerably higher on this part of the doff. As the bobbin size increases the traveler angle of pull becomes more favorable, the twist per inch increases slightly, and generally better running work ensues. For these reasons industry "butters-up" the first part of the doff with a lower speed, at the expense of the full doff which can stand higher speeds.

There have been many attempts at the principle of speed adjustment on spinning frames. Some have used a two speed motor, some a variable speed drive with built-in devices to permit speed increase during the doff, either manually or automatically. There may, also, be direct current drives which offer substantial speed ranges.

All of these drives fall into the same category. They increase the overall speed of the frame. To do this they must be heavily built, rugged, and able to supply the full horse power rating of the main drive.

The switch gear must, also, have a large factor of safety. All this is very costly, space consuming, difficult to maintain, prodigal of burning out electric devices, with attendant production losses.

These applications of speed variation may not be the answer for which we are looking. Perhaps we need a device which will change the twist per inch in the yarn during the doff cycle. The early part of the doff would then receive more twist, which it needs, rather than a slower overall speed, the benefit of which is debatable.

What I have in mind is a very light low cost variable speed drive built into the gear train between the twist gear and the front roll. This could then be set to run plus 5 percent normal twist on the first part of the doff cycle and minus 10 percent or more on the latter part of the cycle. For example, let us assume a warp spinning frame running a ten hour doff has an average front roll speed of 100 r.p.m. With the variable speed device working, the front roll would start the doff at 95 r.p.m. During the first hour the speed would slowly increase until 100 r.p.m was reached. After this the speed would gradually increase to the point of best operating and be held there. Assuming that this point would be 110 r.p.m front roll and would be reached at the half way point in the doff we would then have an average front roll speed of 106.75 r.p.m during the entire doff cycle.

This amounts then to a 6.75 percent increase in production, and in a 50,000 spindle warp room is equal to the production of over thirteen frames of 250 spindles each. Assuming a new spinning cost of $35.00 per spindle, this thirteen frame savings would amount to $113,750.00 of capital expense. The labor saved here would amount to better than $10,000 annually. There might, also, be an added gain in increased spindle assignments from the decrease in ends down. To this could be added the savings in floor space, lighting, air conditioning, and maintenance. One would have something really special to offer the cotton industry if such a unit could be developed at a price which would allow repayment in a reasonable length of time.

SLASHER

A slasher coats the warp with boiling hot size, dries it, splits it back to the individual ends, and winds the many ends onto a loom beam in such a way as to insure their unwinding smoothly and evenly at the loom.

The machine may run from full stop to 100 yards per minute. It must be able to slow back to full stop in a minimum of time and with no lag in any of its sections. It must not overstretch the yarn at any point. It must wind the delivered sheet of warp ends onto a beam which starts off empty and at a relatively high r.p.m. to the same beam which when full has a relatively low r.p.m. The yarn speed is constant and the beam speed must be adjusted to handle it.

Different constructions require different speeds, hence the main drive must be capable of speed adjustment.

For a considerable time variable speed units have produced excellent results on slashers. The usual arrangement is to install a 5 to 10 hp unit in the main drive section. This mechanically gives a slow or fast speed in accordance with either manual, electrical, or electronic moisture control. The basic control is regulation of speed in accordance with the desired amount of moisture left in the delivered yarn. Such a drive is simple, easy to maintain, not too expensive, and offers very few operating problems. It can be used on slashers running at speeds of up to 100 yards per minute.

Another point where a light weight variable speed unit is used on a slasher is between the size box and delivery rolls. On older type slashers yarn tension was maintained by building up the diameter of the breast-roll, or delivery roll, by wrapping cloth of sheeting weight around it. This might be all right for one construction but not for another, and required frequent changing. Some stretch must be ap-

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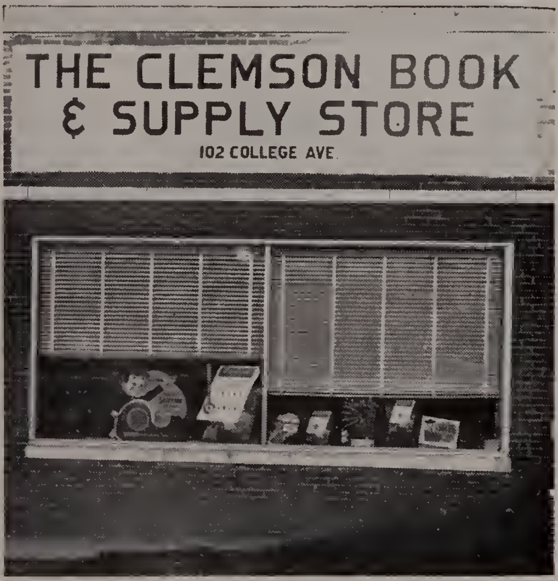

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AN ADDRESS BY DR. ELLISON S. McKISSICK

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world, for a woman chained to a spinning wheel had little time for feminist movements or anything else. The invention of the gin so reduced the cost of cotton that the market for it expanded with the unbelieveable rapidity and for more than 40 years, from the beginning of the 19th Century, King Cotton held absolute sway throughout the South, moulding the course of its economy, its thinking and way of life, and the shape of many things to come.

It is indeed rather interesting to note, however, that this sudden revolution and the flourishing era for the South which followed did not last forever and considerably before the outbreak of the War Between the States, we had become very worried about cotton and its problems — and the problems then were remarkably similar to those we have today. For instance, a report adopted by the Agriculture Committee of the South Carolina House of Representatives in 1842 expressed concern over the great expansion of cotton in the West (the West in those days consisting of the Gulf States and Texas) and sought to make the case that the Western area was sufficient to supply the demands of the world in all time to come. The idea, of course, was that farmers in South Carolina needed to look for some other crop as a source of income.

Now in 1842 the United States produced only a little over a million bales of cotton, which was more than one half of the entire world production. South Carolina accounted for about one-thirteenth of U. S. production then; it doesn't do quite that now, as both its agriculture and its manufacturing industry (which scarcely existed then, incidentally) have become more diversified. But the interesting fact is that world cotton production in 1952-53 was around 29,000,000 bales, the United States accounting for roughly half of it. What would our people who were so worried back in 1842 think of that?

The fact remains, however, that the production of cotton had, a little over a quarter century ago, sunk to a pretty sorry level, compared to what we know today. South Carolina, in 1926, was the first state to start a Five-Acre Cotton Contest and the cotton improvement program of which it is a part and a symbol has demonstrated beyond any doubt that cotton can continue to be the most important cash crop in our state if farmers produce the largest possible yields of good quality at the lowest cost and thereby meet the competition from foreign cottons and the competing synthetic fibers.

The extension service of Clemson College organized the Five-Acre Cotton Contest and the State Publishing Company of Columbia donated the prizes for the first year. Since 1927 the South Carolina Textile Manufacturers Association has donated the state and district prizes and the South Carolina Cottonseed Crushers Association since 1945 has donated the county prizes.

The dramatic increase in quality and yields of cotton in South Carolina over the last quarter century is one of the great epics in the story of cotton. For one thing yield increased from an average of 180.8 pounds of lint per acre in 1921-25 to 314.7 pounds in 1943-52, or an increase of 75 percent. In 1929, only 36.7 percent of South Carolina cotton stapled 15/16" or longer, while now around 99 percent of the cotton crop in South Carolina is one inch or longer.

Another thing — South Carolina has become the undisputed one-variety state of the rain-grown cotton belt, although North Carolina has reached pretty much the same status with the same variety. Actually, California is the only one variety state, where one variety is compelled by law, but here in South Carolina we have done virtually the same thing, not through any law, but by the educational process of "seeing is believing." Today about 99 percent of the crop in South Carolina is planted to a single variety, Coker 100 Wilt. There is no state in the rain-grown belt which equals, either, South Carolina's record as to uniformity of staple length.

There are many who have had a part in this change. It can certainly be called an agricultural revolution, and perhaps that even minimizes the performance. Agriculture in the South, and particularly here in South Carolina, is eternally grateful to the late David R. Coker, who at Hartsville, in our state, pioneered scientific seed breeding, and whose work in this field is carried on today by the organization he founded. And we certainly could never have accomplished, or even begun to accomplish, what we have except for the extension service at Clemson College and the county agents.

I read a speech that was made in Columbia last year by a distinguished scientist, Dr. Robert White-Stevens of Lederle Laboratories, and he paid one of the finest tributes to the work of the county agents I have ever read or heard. I use his phraseology when I refer to our county agents and extension workers as the true pastors of the soil. They are the men who must plant the seed of new practices in fertile ground before any returns from the work of the research laboratory can be harvested. The magnificient system of land grant colleges, state agricultural research and regional training carried to its fulfillment in the county agent has played a role in agriculture that reminds us of the country doctor in medicine and the circuit-rider in our spiritual heritage.

Today in America, thanks to seed breeders, our "pastors of the soil," our technologists and our researchers, and to men like you award winners to

(continued on page 24)

Office Notes

Robert F. Compton, Editor

With the beginning of a new semester, the staff is striving to bring to you a better, more colorful, and interesting magazine. We hope that you, the reader, have enjoyed this issue and we will welcome any comments.

The most noticeable change in this issue is the cover, which was designed by L. D. Tankersley, an architecture student. To quote Mr. Tankersley's explanation of the cover, "You see an undulating composition of the basic weave which suggests boldly, textiles in its most recognized form. The purpose is to bring this conclusion to you in a pleasing and unconscious way through the medium of color and composition. That is because color affects what you see. Sometimes the color that flashes pictures to your mind and memory is a muted tone, it is noticed because of its relation to the hues and composition around it, thus the color has attracted your interest to an area and so to the composition thereon; your interest now is on the composition and it suggests what the content of this publication contains, textile matter. I would now say that if that is the case, the experimentive effort involved has been justified."

In answer to a good deal of comment on the lack of student articles in the last issue; due to the fact that students can write only on general terms or on compiled reading material, it is left up to the men of the industry and members of the faculty to form the back-bone of the magazine. It is from these resources that the reader can expect to find articles which are both informative and up to date. The fact that THE BOBBIN & BEAKER is a student publication does not necessarily mean that it must be written by the students. The true meaning of this statement is that the staff members, who are students, compile the articles, solicit the advertising, and run the magazine as a whole, with the hope of depicting the independence of the textile school and the industry; thereby keeping its readers informed of the latest in the field of textiles.

Dr. A. N. J. Heyn, member of the faculty of the School of Textiles, has written a book entitled "Fiber Microscopy." This book is being used as the textbook for Microscopy courses here and in other schools and contains some very useful information concerning fibers and their properties. Other information concerning Dr. Heyn's publication may be found in this issue.

WHAT TEXTILE PREPARATORY MACHINERY NEED VARIABLE SPEED DRIVES AND WHY

(continued from page 19)

plied in order to split the warp sheet at the exit split rods. However, excessive stretch definitely reduces warp performance in the weave room and should be avoided. For this reason, the use of the light variable speed unit very effectively give close regulation of yarn stretch and makes it easier on the operator to accurately control this important feature.

Still another variable speed unit is made for use on a slasher to take the place of the old style friction clutch used to control the relationship between the delivery speed of the yarn which is more or less constant, and the r.p.m. of the loom beam which is fast on the empty beam and slow on the full beam. On more modern higher speed slashers this represents quite a problem which very definitely rules out the old style slip clutch. There are variable speed units available which handle this control very efficiently, give only minor maintenance problems and run at high speeds on stiff operating schedules. The range of counts and ends such a unit can handle falls well within the pattern of the average mill and this offers no great problem in upkeep of highly specialized equipment. One tangible gain from this drive is the increased yardage wound on the loom beam due to uniformity of tension. This may amount to from 10 to 15 percent increased yardage — above that of a regular drive.

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AN ADDRESS BY DR. ELLISON S. McKISSICK

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whom I referred earlier as the real "kings of cotton," our cotton fiber generally has qualities that make it most desirable throughout the world. Yet it costs more to produce cotton here than in less fortunate parts of the world which do not have our enviable standards or economic system or our dynamic free enterprise. However, in many backward countries of the world, improved cotton varieties and production methods are today making much headway.

The American textile mills, which consume the great bulk of domestic cotton, basically face the same situation. Economists tell us that American textile prices relative to costs — and this involves our high standards of living in America — are the lowest in the world, and any lowering of them further to meet an inrush of cotton goods from low-cost foreign countries could mean only substantial unemployment or wage reductions, and consequently, a substantial reduction in the domestic consumption of U. S. cotton.

Relative to production, our cotton goods exports are traditionally the smallest of any important cotton manufacturing country. In 1953, the figures for the first nine months indicate we will run far behind Japan, the United Kingdom and India in export of cotton goods. Not only our exports, but the total volume of world trade in cotton goods, has steadily shrunk and the process has been aided by a multiplicity of import restrictions applied against the United States. Certainly world trade cannot be revived by programs, so common outside of North America, of trade restrictions and nationalisms which tend to decrease per capita consumption of cotton.

The economists have figured that if per capita consumption of cotton can be raised to one-half of the United States level, all the spindles and looms now in existence in the world would be inadequate to meet the demand. That is why in our industry we feel that the only way out of the dilemma must be a vigorous new foreign trade policy which recognizes the true causes behind the worsening picture and which will help more of the world's people to expand their consumption of cotton and of cotton textiles. Here in South Carolina, where cotton is the basis of our agricultural economy and cotton manufacturing is our greatest manufacturing industry, we have a large and very real interest in the untangling of the jungle of foreign restrictions which prevent a normal and healthy pattern of international commerce.

It can be done if we discard the smokescreen and recognize the actual causes of trade distortion — the same way we here in South Carolina more than a quarter century ago recognized the true causes behind the situation into which our cotton production had sunk, and begun a corrective program whose magnificient fulfillment is impressed upon us so unforgettably today as you "kings of cotton" receive your awards for your attainments which — to use one of today's common expressions — would have seemed "out of this world" a scant generation ago.

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SUMMER ISSUE 1954

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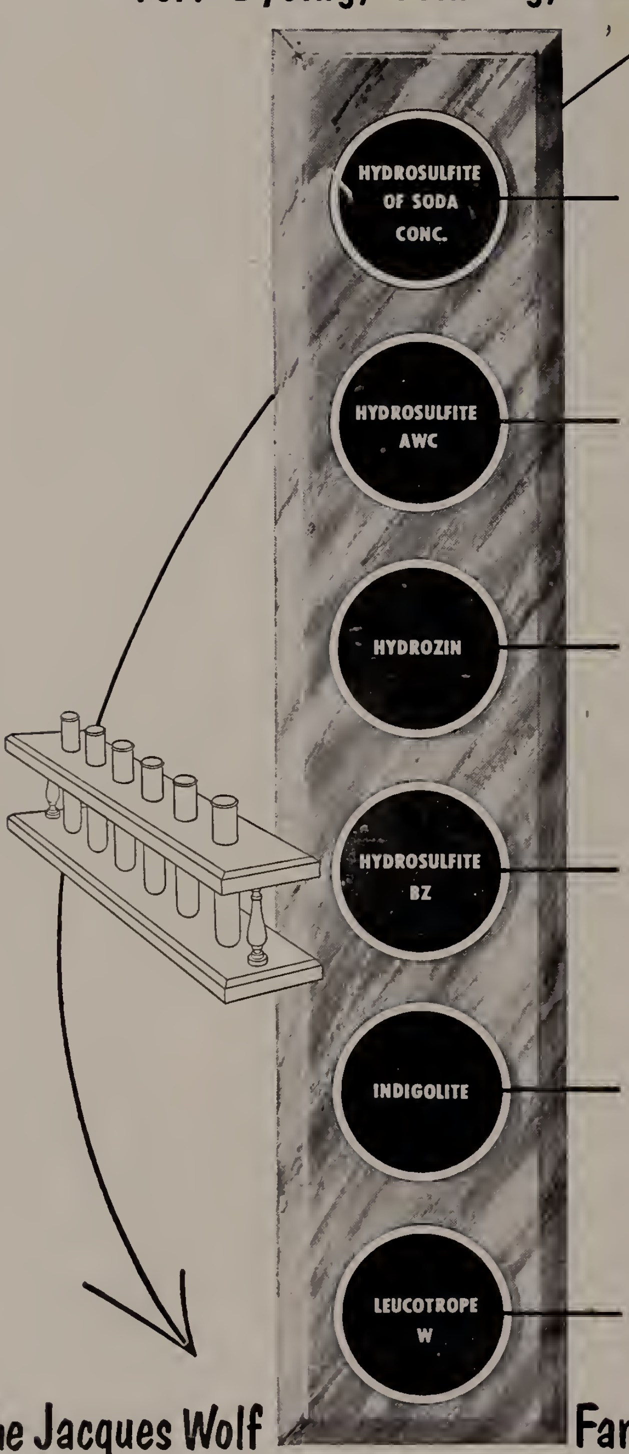

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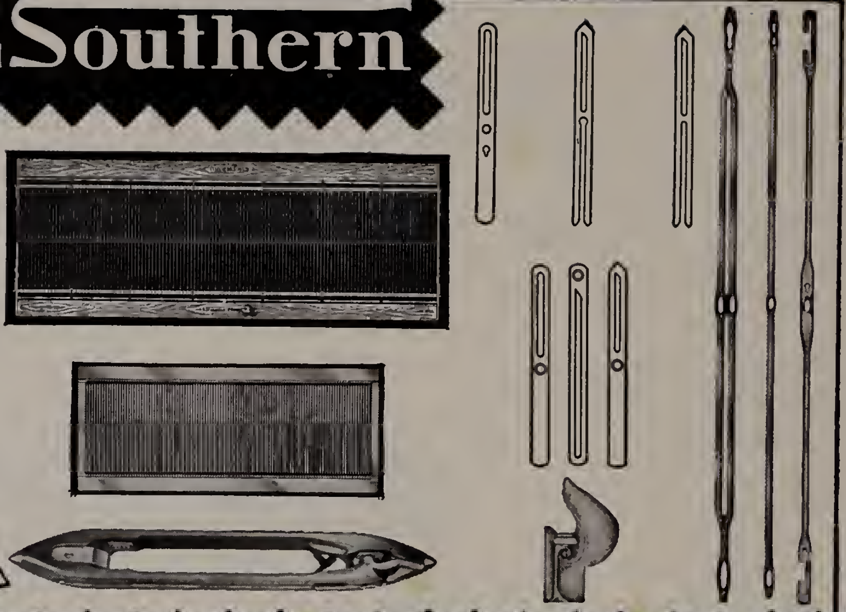

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THE

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Improvements in Card Operation

HUGH M. BROWN and JOHN L. THOMPSON
Clemson School of Textiles

Several years ago it was proposed in the Clemson School of Textiles to determine if the carding operation could be improved by reversing the motion of the flats. It was found that the idea has been frequently proposed throughout the history of revolving flat cards, but for some reasons the practice seems not to have had any wide spread adoption. Possibly research unknown to the writers has shown that disadvantages outweigh the advantages of the method but in the absence of such information a study of the problem is now being undertaken at Clemson. This is a very preliminary progress report on the work begun last summer.

It seems fairly obvious that the loading of the flats while in contact with the cylinder would be quite different when run opposite to the usual direction. Also the type of material brought out on the flats should be different for the two directions. When run to the rear, unopened tufts of cotton and pieces of trash might be brought out, which in normal operation must be cut up or pulled apart by the cylinder before they reach the front of the card. This is surely not the best use of cylinder clothing though it is fortunate the pieces are cut up and at least partially removed by the flats. Small areas of flat clothing, covered by such tufts, may be a cause for neps being made by the cylinder rolling cotton under them.

A study was made on the loading of card flats by cranking them off the cylinder at the rear after the card had been stopped by turning off the power with the feed gear. This makes it possible to weigh single flat strips removed one at a time. The flats were numbered from (1) to (44) from back to front starting with the first flat that has fully contacted the cylinder at the rear of the card. This was done for both directions of running the flats and the weights plotted against the distance of each flat from the rear of the card.

When the flats are run normally the load from the rear to the front is almost constant except for the two or three flats that had last entered the card at the back. This shows that each flat as it enters the card is overloaded and the cylinder soon levels it down to the constant load it will carry until it reaches the stripper at the front.

When the flats are run backward they are clean when they enter the front of the card and slowly load as they move toward the back. They become fully loaded only as they leave the cylinder but for the first two or three flats the load is higher than for normal running. However, part of the load carried out by each flat is picked up as it is leaving the cylinder so that many unopened tufts, seed particles, etc., are kept from ever being worked by the cylinder. Due to this action in reverse operation the character of the flat strip is entirely different from usual flat strips. Since properly stripping flats causes them to make less neps, it seems that the clean flats coming in from the front should catch neps off the cylinder better than when they are loaded in normal operation.

To test these points it was arranged to run the flats backward simply by uncrossing the belt that drives them and to get several flat speeds by using different pulleys. One hour runs were made by manually stripping the flats at the back. The procedure is to thoroughly strip and clean the card and run it until the flats have moved more than the distance from front to back. The nep count is then carefully taken always by the same operator and weighings made of the following items:

1. Cotton fed during run.
2. Flat strip.
3. Cylinder strip.
4. Fly waste.
5. Lickerin waste.
6. The sliver produced.

The sliver is then tested on the Shirley Analyzer to determine the percent foreign matter. The project is only begun but more than forty runs have been made and it is hoped that the data is sufficiently interesting and valid to be worthwhile presenting at this time. The results shown are all for one Woonsocket card running with normal settings and speeds. Unfortunately the data was not all on one kind of cotton staple lengths 1-1/16 and 1-3/32 respectively.

Table I shows the data taken from which several rather definite trends seem evident.

1. Reversing the flat motion gives a definite reduction in neps for lower rates of production at normal flat speeds and there is an increased reduction in neps with decreased flat speeds running them either direction.
2. Percent foreign matter left in the webb increases with lower flat speed in either direction but is not increased appreciably above normal for speeds down to one to two inches per minute.
3. As would be expected the percent flat strip rises rapidly with flat speeds in either direction but may be less than normal even for reversed motion by reducing the direction of motion.
4. There is considerable reduction in cylinder strips for any reverse flat speed over that for forward speeds.
5. Total waste decreases with flat speed for either forward or reverse running. (See Table I)
6. Reversing the direction of the flats gives less reduction in neps for higher rates of production.

In view of the above trends, assuming they will obtain under mill conditions, it seems in the manufacture of quality goods where the rate of carding is less than 10 to 12 pounds per hour, it would pay to both reverse and reduce the motion of the flats.

Though there might be a small increase in foreign matter left in the webb, this would be more than offset by the gain from a simultaneous reduction in neps, flat strip, cylinder strip and total waste. It is believed the additional foreign matter is mostly lost during later processes. In the gray yarn spun from sliver made in this manner there was no significant difference in strength, evenness or appearance. However, when the yarn is dyed a deep shade there is observed the same reduction in neps that is found in the card webb.

All of the work so far has been done with one arrangement of card settings and speeds. It seems unlikely that the best arrangement would exist on this card and it is hoped that the project advances changes in settings, lickerin speeds, etc., will show still greater improvement in carding operation.

Now to put this plan to use in the mills requires more than uncrossing the belt driving the flats. There is a stripping problem. Two solutions for this problem have been developed at Clemson.

One is a modification of the present stripper so that it will strip the flats when running in the opposite direction. The strip is gathered on the scavenger roll as at present and the method involves nothing different in the operator's job.

The present stripper comb is given a larger stroke by enlarging the usual operating cam. At the bottom of the stroke the stripping is carried past special blade and is caught between it and a scavenger roll which is postively driven by a rachet and pawl.

Plans are under way to develop a scavenger roll type to operate at the rear of the card so that flats can be stripped before going over the top.

A second method of stripping the flats has been developed for a different kind of operation. When carding synthetic staple there is no reason for keeping out the flat strip and this is also the case for a number of uses for cotton when there is no objection to some additional neps.

For this purpose the stripper is placed at the rear of the card and arranged to drop the strippings back on to the ingoing lap. A stripper comb (1) is pivoted on a shaft over the licker-in housing so that it may be rocked back and forth past the flats and the scavenger comb. The strippings, as they are pushed off the scavenger comb fall in a sheet back on to the entering lap.

With these devices it is possible to have reversed flat motion either to reduce neps for a high quality product or to automatically put the strippings back in where such operation is desirable.

The present findings have raised several questions:

1. How does lower flat speed reduce neps?
2. How does reversing the motion give reduction in neps over forward running?
3. Why does reduction of neps by reverse motion decrease with higher production?
4. How does reverse running at any speed give less cylinder strip than do forward speeds:

Again it is stated this is a preliminary report and many more aspects of the problem are to be studied.

TABLE I

Approx. prod. lbs./hr	Flat speed in./min.	Neps Per 100 sq. in.		Trash in sliver		Percent flat strip		Percent cylinder strip		Percent total waste		Number of runs	
		F	R	F	R	F	R	F	R	F	R	F	R
6	1.44	69	70	102	103	61	68	113	85	89	93	1	1
	1.90	93	78	93	103	67	81	106	90	100	94	1	
	4.00	100	84	100	97	100	115	100	75	100	110	7	4
	6.62	132	97	83	84	130	165	111	89	125	110	1	1
	24.		117		75		480		80		248		2
8	4	100	88	100	96	100	130	100	75	100	104	1	1
10	4	100	84	100	71	100	129	100	83	100	107	1	1
14	4	100	103	100	97	100	120	100	84	100	102	3	3

Showing percentages of values given by normal forward speed (4"/min.) being used as 100 percent

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Who Wants Shrinkproof Wool Anyway?

DR. E. A. MURRAY

Biographical Sketch

Edward A. Murray is a native of Tacoma, Washington and graduated from the University of Washington in 1938 in chemical engineering. After three years at Oregon State College as an instructor in chemical engineering, he went to The University of Texas for further graduate studies and received the Ph.D. in chemical engineering in 1946. During the war years, he was group leader in the Research Division of the National Cotton Council, in charge of a project on the application of high polymers to cotton prior to spinning. From April 1946 until October 1952, he was connected with the Deering Milliken Research Trust, and during the last four years of this period, served as Director for Chemical Research. He is now engaged in consulting in textile research and development, and is associated with the Clemson Textile Department on a part-time basis conducting research on small-scale finishing tests for cotton.

It was first recognized about a hundred years ago that the laundering shrinkage of woolen textiles can be minimized by certain treatments. It would probably be a gross exaggeration to say that more man hours have been spent on developing and promoting shrinkage control methods than in producing stabilized fabrics since that time, but the efforts of the entire woolen textile industry are nonetheless reminiscent of the labor pains of the mountain in giving birth to the mouse. There are some exceptions to this generalization; quite a number of mills have been able to make a successful entry into the washable woolen field since World War II, and some of their products are outstanding. But considering the effort and money invested, the results of most attempts to manufacture washable woolens have been disappointing.

To those who have heard the anguished housewife's cries of rage and frustration on removing from the Bendix washer the family blankets, now shrunk to crib size, there is no need to explain the desirability of washable woolens. Unless ordinary woolen articles are laundered with great care, they are likely to shrink during washing as much as 10 to 30 per cent, as indicated by Papa's bulging eyeballs when he buttons the collar on his hunting shirt after a prolonged, and accidental, laundering with a lot of the children's overalls. Experiences of this type are common, and explain the average housewife's enthusiasm for washable woolens. Why then, haven't washable woolens taken hold? There seem to be two main reasons:

1. Most of the existing commercial processes, while not prohibitively costly, impart certain undesirable qualities in addition to the desired shrinkage control.

2. The control of felting shrinkage is only part of the problem. Selection of washable dyes and the control of relaxation shrinkage are at least as important, and probably as difficult as the elimination of the felting shrinkage.

Small wonder then, that for the past few years a good many mill men have been saying, in effect, "We'll get into washable woolens when competition forces it, and probably not before. Who wants shrinkproof woolens anyway?" Since washable woolens are far from dead, it may be interesting to examine some of the deficiencies of past and present processes.

The Mechanism of Wool Shrinkage

The manner in which a fabric shrinks depends on a good many things, such as fiber composition, construction, and manner of laundering. There are two entirely different types of shrinkage encountered in laundering woolen fabrics, both of which must be considered in producing a washable woolen:

1. Relaxation shrinkage, representing a suppressed desire on the part of the fabric to return to its original form, before the stresses of finishing operations like dyeing, drying, and shearing, distorted it. Relaxation shrinkage is not peculiar to woolens alone; it is present in all fabrics which have not been specially treated to remove it. "Sanforized" cottons, for example, are fabrics in which the relaxation shrinkage has been removed by compressive shrinking. Unless they are specially treated during finishing to remove relaxation shrinkage, most fabrics will shrink up to 6 or 8 per cent in each direction the first time they are washed.

2. Felting, or Progressive Shrinkage, is a property of most of the animal fibers like wool, mohair, and rabbit fur. Fabrics which consist wholly, or in major part, of wool or other animal fibers don't stop shrinkage after the first wash. Each time the fabric is subjected to wet mechanical action, it will shrink more—hence the term "progressive." This shrinkage, moreover, can't be removed by any simple mechanical process like Sanforizing nor can a felted article be returned to its original shape by stretching. Mrs. Jones can tell you all about it.

The progressive shrinkage of woolen textiles, which perhaps is not fully understood, is apparently due to the scaly surface structure of the fiber. The animal fibers are unique in this respect; the synthetics and cotton, which have smooth surfaces, do not felt. The

(continued on page 19)

Cover -- Or Face on Cloth

By **W. BRATTON WILLIAMS**

The qualities of a woven fabric must measure up to certain standards and specifications, and one of those qualities is that the fabric must have sufficient cover.

Cover may be defined as the appearance and feel of the cloth as to smoothness and softness and with an absence of roughness and reed marks.

This quality, cover, is especially desirable in such plain woven cotton fabrics as broadcloth, print cloth, and sheetings.

In order to have cover, the warp must be made to lie straight in the fabric and the filling must be made to do the bending. If the warp yarn does most of the bending while interlacing with the filling, roughness and reed marks are certain to be the results. This is true because of the fact that the warp is a tougher yarn than the filling — contains more twist, and is coated with size from the slasher. If the warp is made to lie straight while the filling does the bending, the filling being softer than the warp—less twist and no size—will spread out and fill up the cracks. This tends to add to the fabric that necessary characteristic called cover.

There are three settings that can be varied on the loom which affect cover in the fabric. These three will be taken up separately and discussed briefly. It must be kept in mind, however, that those things that are done to add cover to the fabric have certain disadvantages in weaving because if the warp is to be forced to lie straight it must be placed under greater tension, thus adding to the possibility of increased end breakage.

The timing of the harness is the first requisite for getting proper cover. Many mills on standard fabrics such as narrow sheetings, broad cloth, 80 squares and other standard print cloths, have a rule that the harness are timed so that they are level while the crankshaft is on bottom center. (The reed will be approximately 3½ inches from the fell of the cloth). This is the earliest that the harness can be timed in relation to the pick, and this timing gives the best results as to cover. However, the strain on the warp is at a maximum with this timing because the filling is beat up in a locked shed for 3½ inches. During the beating up process, every other warp end (if it is a plain weave) is pulling upward on the pick, and every other warp end is pulling downward on the pick. This action forces the filling to do the bending, but the chafing of the filling against the warp causes a maximum of strain on the ends. At beat-up (when the reed hits the fell of the cloth), the harness are open for the next pick. This again places undue strain on the warp because the reed strikes the fell while the harness are open and the warp is drawn tighter while the shed is open for the next pick.

Many fabrics can be woven, and the desired cover can be secured, without timing the harness as early as is the conventional custom. If timing the harness at 2½ or 2 inches instead of 3½ or 3 inches gives the desired cover, then it might be advantageous because the later the timing, the less is the strain on the warp yarn. With the slightly later timing, the pick will not be forced as far through a locked shed, and the harness will not be open quite as wide for the next pick at beat-up.

Another setting which affects cover is the height of the whip roll. Many textile plants weaving in the range of fabrics mentioned above, run their whip rolls at a customary height regardless of the particular construction being woven.

The higher the whip roll, the more strain is placed on the warp yarn (bottom) shed, and less tension on the top shed. As the whip roll is raised higher, the bottom shed is farther away from the warp line (straight line distance from the top of the whip roll to the top of the take-up roll), and the top shed lies closer to the warp line. This causes the bottom shed to be extra tight and the top shed to be correspondingly slack. The beat-up action then takes place in a locked shed—one tight and one slack. The tight shed forces the filling to bend through the slack shed. If both sheds have the same tension, they tend to "balance" each other as each end forces the filling in the opposite direction.

Many plants probably run their whiprolls higher than is necessary to get the desired cover. It is true that the higher the whip roll the better the cover, but in some cases "The Law of Diminishing Returns" may be reached. Therefore, if it is possible to lower the whip roll one or two inches and still maintain sufficient cover, strain will be relieved on the bottom shed and this may prove advantageous in less loom stoppage.

Almost all cam looms today are equipped with whip roll cams. The action and timing of this cam, through the whip roll cam follower, gives a vibrating movement to the whip roll which affects cover on the cloth. The purpose of the whip roll cam is to raise the whip roll slightly as the reed approaches the fell of the cloth for the beat up, thus increasing the tension on the warp yarn at the instant it interlaces with the filling. This increased tension on the warp again prevents it from bending and forces the filling to do the bending.

The proper timing for the whip roll cam is as follows: With the shuttle in the left hand box, turn the crankshaft toward front center until the reed is ¾ inch from the fell of the cloth, and set the whip roll cam straight up so that the whip roll cam follower is at its highest lift. As the reed hits the fell of the cloth, the cam will be falling and the tension on the warp yarn will be slightly decreased. Some plants have a rule that requires the whip roll cam to be set straight up while the crankshaft is on exact front center. This setting adds the maximum tension to the warp in that it is held under the greatest of tension as the reed strikes the fell. This setting does not add noticeably to the cover, but may add to end breakage because of the excessive strain.

On the X2 Model looms that are being manufactured today, the whip roll cam is made less off-center The purpose of this is to reduce the amount of vibration of the whip roll and consequently to reduce the strain on the warp yarn at beat up. Some textile plants have purchased this type cam as replacement on their E Model looms.

In conclusion: Do not time the harness earlier than is necessary to get the desired cover. Do not set the whip rolls higher than is necessary to get the desired cover, and do not time the whip roll cam to be straight up when the reed is later than ¾ inch from the fell of the cloth. Approaching the extreme in any of these settings may produce some disadvantages in that they cause unnecessary strain on the warp without any noticeable improvement upon the character of the woven fabric.

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WARP PREPARATION, FILLING PREPARATION AND WEAVING AT CLEMSON

A. E. McKenna, Head, Weaving and Designing Dept.

Years ago emphasis in teaching warp preparation and weaving at textile schools was placed on fibers in processing cotton, wool and rayon. Now all fibers in several schools are taught under one heading and only differences in methods of handling are brought to the attention of students. Instead of rayon warp preparation, or rayon weaving, it is now warp preparation or weaving of all fibers, natural and man-made.

At Clemson, fibers are warped and slashed for a variety of fabrics for courses in loom mechanism, knitting, and fabric development. Over 90 percent of the warps used in the weave rooms are prepared on the schools equipment and 76 per cent of these are single-ply or low-twist yarns which require the application of size through the operation of the slasher. In this actual processing, students acquire knowledge and experience in the various sizing products and in handling different types of fibers. Research has been conducted for several years on size mixtures for the new spun synthetics. In the manufacture of South Carolina State flags, a high percentage of the yarn is spun in the Carding and Spinning Department; the cloth woven in the Weaving and Designing Department; and the flags cut and sewed in the Knitting Department.

Warps at present on looms in the school are made from cotton, spun rayon, filament rayon and acetate, filament nylon, wool and orlon blends, vicara, rayon and acetate blends, and Fiberglas. Approximately 79 per cent of the warps are cotton, 18 per cent filament rayon, acetate, and nylon; and the remainder spun rayon blends, and wool blends. Looms used in weaving these fibers are as follows: For cotton — E, K, X, X2, XP, Hopedale, Stafford, Fletcher, C-5, C-6, C & K Worcester Model, and C & K Providence Model; for continuous filament synthetics — XD, S-3, S-4, and S-6; for wool and spun rayon blends — XD, XP special, C-4, and W-3.

Quill winding is taught and processing accomplished on all types of fibers in one course. The course in throwing covers all continuous filament synthetic yarns and the actual processing carried out for sample weaving or knitting. In Fabric Development, instruction is not only given in the designing and weaving of all-cotton fancy fabrics but also blend suitings, and continuous filament synthetic constructions.

The manufacturers of all synthetic yarns and the many suppliers of sizing materials have very graciously supplied our every need. This applies not only to sizing materials for man-made fibers but also to starches and compounds that are used in sizing cottton.

Textile Essay Contest

GARLAND W. DUVALL

Of recent interest to both students and faculty in the School of Textiles has been an essay contest. This contest was sponsored by one of the industry's most popular magazines, "America's Textile Reporter," as part of the promotional campaign for the Textile Machinery Show in Atlantic City.

The contest was open to all students regularly enrolled in the ten textile schools over the nation. The winner from each school received one hundred dollars and an expense paid trip to Atlantic City and the show for his efforts. One day during the show has been set aside as "College Day," at which time these ten young people will be honor guests at a luncheon along with the deans of the textile schools. This was certainly a reward worth making an effort for.

The essays were written on the topic "Why Should Management and Operating Personnel Attend the American Textile Exhibition in 1954?".

The winning essay at Clemson was written by Garland W. Duvall, a junior from Cheraw, S. C. Second place went to T. F. Ballentine, a senior from Blythewood, S. C., and third place to Zane O. Brock, a sophomore from Anderson, S. C.

The faculty wishes to compliment all the entrants collectively and each individually on his efforts. There were several excellent essays entered and the losers can feel assured that they lost to an excellent entrant.

We wish Mr. Duvall a pleasant and informative trip to Atlantic City and anxiously await news of the exhibition, festivities, etc. of which he will be a part.

Mr. Duvall's winning article follows.

Why Textile Management and Operating Personnel Should Attend the American Textile Management Exhibition in 1954

The more industrialized a society becomes, the more carefully must human effort be coordinated. The more interdependent society becomes the more communication there must be. The need for everyone to be understood by other persons is a direct outcome of this vast social interdependence which industrialization has created.

Through the ideas of men the textile industry has advanced to its present stage. These ideas or developments have been inspired by the need for them, for indeed, in the textile industry, as in the other phases of life "Necessity is the mother of invention." During and before the colonial period, cloth was made at home, but, as the pace of life grew faster, and the housewife had more to do, spinning and weaving at home became impracticable and burdensome. Because of this need for ready made cloth and clothes, factories were built and the textile industry had its beginning.

Before today, men in the textile industry had to advance it more or less on their own. Only one man or a small group of men could decide what was good or bad for the factory. They could not collect the ideas of all the men in the industry and evaluate them, nor could they exchange views as to management and operation, as they can now, for there were no conventions or displays of everyone's ideas. Truly this was a tremendous drawback, when it is realized that an individual man has exceedingly limited capabilities.

For the benefit of the entire textile industry the American Textile Machinery Exhibit is held in Atlantic City, New Jersey. Manufacturers pool the discoveries and resources of their laboratories. To bring new systems into being hundreds of scientists and engineers spend millions of man-hours of time. Here they pool their discoveries for the good of the industry and the public.

Progress is the American by-word. We must all recognize that we live in a dynamic society, which is characterized by change, and constant adjustment to these changes are necessary if we are to progress. The textile industry is progressing in every phase of its activity. It will do no good though to have progress if the mills do not know of it. The exhibit is the industry's way of transferring the progress of the machine manufacturer to the machine user, of transferring the thoughts of the scientists to the mills of the producer. It is here that the mill executive can get a wealth of fresh ideas and glimpse new ways to solve old dilemmas.

(continued on page 16)

Where Are They Now?

By Fred H. Hope, TM '55

Upon their graduation in June, Clemson textile graduates will go into the textile world to pursue their ambitions in the field they have chosen. These new graduates are not likely to be among complete strangers, as they will probably meet old friends and classmates in any of the various textile concerns throughout the industry.

In the following paragraphs are listed a few Clemson graduates and the positions they now hold in the textile industry.

Cannon Mills Company: Malcolm B. Bishop, Jr., '50, assistant personnel director; J. Harris Cannon, '37, vice-president; Richard Clayton, '53, trainee; Farrar O. Griggs, '36; assistant purchasing agent; George William Griggs, '49, overseer of weaving; Sewell Edward Hunsuck, '48, chemist; Merton Carlyle Propst, Jr., '40, assistant laboratory director; William Beaty Thompson, '33, superintendent of finishing.

American Enka Corporation: E. M. Salley, Jr., '27, plant manager; Ross M. Stribling, '29, assistant manager, technical service; Lawrence Hart, '31, textile engineer, research department; W. W. Abbott, '42, technical supervisor, textile department; R. M. Phillips, '47, textile engineer, research department; James M. Chapman, '49, technical assistant, spinning and finishing department; C. M. Guest, '49, technical assistant, research department; Charles Robinson, Jr., '49, assistant to technical supervisor, textile department; G. M. Devlin, engineer, '50; Richard M. Hart, '50, engineer; Grover C. Haynes, Jr., '50, engineer; T. L. Howle, '50, assistant chemist, research department; W. B. Cassidy, '51, textile engineer, technical service; C. H. Weedon, '52, assistant research chemist, research department; W. C. Compton, '53, junior textile engineer, technical service; R. R. Fowler, '53, junior textile engineer, textile laboratory; C. H. Peppers, '53, assistant to manager, microscopical laboratory.

Joanna Cotton Mills Company: J. K. Waits, '47, head of standards department; F. H. Simpson, '51, laboratory director; R. A. Bridges, '51, industrial engineer; L. A. Crawford, '47, assistant superintendent; W. W. Niver, Jr., '36, cost accountant; H. M. Hunter, '28, pay master; J. E. Willingham, '46, Industrial engineer.

Fieldcrest Mills, Inc.: David E. Simons, '34, superintendent of towel mill; Carlisle C. Campbell, 1913-1914, pay master; Samuel T. Anderson, 1915-1916, superintendent of bedspread mill; Clyde L. Miller, '50, development engineer; Benjamin Lee, '05, formerly Master Mechanic and Machinist, now retired under pension plan; Richard Tuttle, 1925-1926, manager of engineering, research, quality control and supply purchasing; W. R. Kiser, 1939-1940, supervisor of methods and standards; J. E. Cobb, '37, foreman of weaving department.

Cone Mills Corporation: H. Paul Bridges, '35, superintendent.

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BOSTON NEW YORK

The Textile School Takes to the Air

C. H. Ferguson, '55

The faculty of the School of Textiles of Clemson College, through the courtesy of the Clemson Journal and in coordination with J. R. (Bob) Mattison, moderator of the program, "takes to the air waves" (dial 560) each Wednesday on the 12:45-1:00 program to bring you the latest news of interest in the textile world.

On March 3, Dr. H. M. Brown, Dean of the School of Textiles, delivered a talk explaining the growth and betterment of our school since World War II. One far reaching aid to the school is the Sirrine Textile Foundation of nearly a million dollars contributed during the war by South Carolina textile companies. "These funds are being used to enhance the retirement pay for members of the textile faculty, to employ extra professors who work on research, to provide funds to facilitate the visitation program, and to enlarge the student magazine, THE BOBBIN & BEAKER." "The Foundation has also furnished equipment, books and a librarian for a fine textile library in Sirrine Hall."

A full major course in Knitting, graduate work leading to the Masters degree in Textile Chemistry and Dyeing, research, and many other projects and developments in the School of Textiles has been greatly expanded.

The following are more important items which were pointed out in Dr. Brown's speech:

1. A loom drive to increase the speed of looms without increasing shuttle time. It seems that production can be readily increased at least 15% without materially increasing maintenance cost.
2. A loom warp tension control has been developed that gives constant tension during the entire run down of the beam with no adjustment.
3. A Flat Bundle Tester has been developed for better measurement of cotton fiber strength. The unit is ready for the trade by one of the leading textile testing machine companies.
4. A pneumatic type warp tension control simultaneously giving equal tension on any number of looms in a group.
5. A picker lap meter suitable for permanent mounting on pickers to show instantaneous weight of lap at all times, and to show uniformity of the lap.
6. A new Loom Temple not using rolls.
7. An improved device for spinning frames to insert temporary twist in the yarn between the rolls and the thread guide to reduce ends down.
8. A Tensile Testing device where in indices of strength, and strength uniformity, are obtained while the yarn is being run continuously.
9. A tension control for warper beams in a warper creel. This device is entirely mechanical and gives the same tension on every beam by means of a weight that can be computed in advance.
10. A device to indicate when an end is down on spinning frames.
11. A device for making a Leno weave impossible on present textile machines.
12. A simple device for roving frames that reduces textile manufacturing cost and improves the roving and yarn at negligible cost to the mills.
13. An improvement in carding giving less neps the product and reduced waste.
14. Dyeing of Orlon with vat and sulfuric colors.
15. Studies on antistatic agents for Orlon and Dacron.

All of these developments are in operation on machines in the Textile School and have been reported at textile meetings and in trade journals. They have been seen by many interested visitors to our school and a number of them are being manufactured for the industry.

On March 10, Professor John V. Walters answered some questions that are of interest to the consumer of woven fabrics. The fish-like odor given off by raincoats on rainy days is due to a resin finish which is used as a water repellant. Manufacturers know how to eliminate these odors so any such raincoats should be sent back to the manufacturers. Professor Walters also pointed out that felt fabrics are neither woven nor knitted, but pressed into shape with the help of steam, pressure and high heat. Therefore; clothing made of felt should not be washed as ordinary garments but sent to your dry cleaner. "This includes garments with felt applique trimmings and others of such nature. For best results, take measurements of your garment and attach them to the article, it will aid the dry cleaner in his work."

Professor W. C. Whitten pointed out that cotton is still "king fiber." In the past few years we have come into contact with many so called miracle fibers (nylon, orlon, dacron, etc.) that we are failing to realize the importance of cotton today. "To make a comparison, let's stop for a minute and think what it would be like if we had never had the benefit of cotton and someone had suddenly begun to grow it in such quantities as to let us have just a taste. Think of the clamor it would cause—of all the possible uses to which you could apply this new fiber "cotton." It is hard to imagine that cotton would not soon be called a "miracle fiber also?"

Even with all the new fibers of today, cotton is still improving its competitive position. The staple length of cotton has been increasing which serves in making stronger and better fabrics. While on the other end, improvements have been made in the finishing of cotton fibers.

Professor J. H. Marvin brought to us the many different problems which are faced in the textile industry today. "A summary of the problems would be as follows:

(1) securing the baled cotton
(2) planning and controlling the flow of stock
(3) processing the stock properly
(4) supervision of the personnel
(5) controlling the cost
(6) upkeep of equipment, buildings and machinery and handling of supplies
(7) handling of the payroll and personnel work
(8) keeping necessary records of all the mill activities"

On April 7, Mr. J. S. Graham, Assistant Professor of Research and Testing, told us what tests are performed on cotton fibers at Clemson. He pointed out that in the Textile School, we are set up to perform almost any fiber test from x-ray analysis to the simplest types of test. It is interesting to note that fineness is the fiber property most often specified in buying medium staple length cotton — however, the manufacturer who uses short or medium staple cotton in this country is not concerned with this type of fiber since all of the commercial fine-fibered cottons are long staple cottons. Most of our medium staple crop can be classed as American Upland which produces medium staple and medium fineness unless immature.

Professor A. E. McKenna pointed out the types of fibers and fabrics being processed at the Clemson Textile School. "At present we are weaving or knitting cotton, viscose, acetate, nylon, fiberglas, wool, vicara, and blends of these fibers with about 50% of our equipment on cotton." In woven cotton fabrics or fabrics made from man-made fibers, we are weaving awning duck, osnaburg, print cloth, sheeting, twill, sateen, gingham, woven tuck, bedspreads, drapery, terry toweling, dress goods, blanket material, and many others. "In our garment making manufacture course, students are cutting out and sewing T-shirts for men and children, underwear and women's tricot lingerie."

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Several Types of Fibers Are Used In the Knitting Department

THOMAS D. EFLAND,
Weaving and Designing Department

Recently the knitting department has been working with a wide range of fibers in the knitting of hosiery and other fabrics. Usually the entire range of fibers suitable for knit fabrics are employed in the normal schedule of instruction in the knitting laboratories. By giving the students an opportunity to work with a number of fibers he gains some experience in the proper techniques of handling the yarns and in evaluating the characteristics and properties of fabric made from them.

Currently the stretch sock is the most popular item in the hosiery trade. The knitting department has followed the development of this type of hosiery very closely and has knit hosiery from elasticized nylon yarn. Several processes have been developed for imparting elasticity to a continuous filament nylon yarn by physical means. The most common method is to highly twist the yarn, heat set it, then back out the twist. The process is patented by the Heberlin Corporation and is licensed to a number of commission throwsters. Several other companies have recently announced processes for elasticizing nylon but have not released information on the processes to date.

Hosiery produced from elasticized yarn is characterized by unusual elasticity which allows one sock to be made fitting a complete range of foot sizes. The processing of the yarn imparts to the fabric a warm soft hand and a pleasing appearance considerably different from that found in fabric knit from regular nylon.

During recent months, the knitting department has used a number of yarns produced by the yarn department. A yarn produced from Vicara, viscose and acetate was knit into both Komet Rib and plain knit hosiery. A wool nylon blend was used in several types of hosiery and recently a spun acetate yarn was employed on our jacquard sweater machine.

A number of patterned and plain fabrics have been knit on the sample tricot machine. Some of the most interesting of these resulted from various combinations of spun dyed acetate used with white acetate and with nylon. A sample of fabric with very low elasticity was produced with a 75 denier Orlon face and a 70 denier nylon back. The experimental purpose of the fabric was to combine high tenacity nylon for strength with Orlon on the surface to prevent weather degradation.

Currently the knit wear laboratory is setting up a pattern for all wool sweaters. The fabric will be produced on a Jacquard Links & Links machine and the garments sewed in the sewing laboratory.

With yarns obtained from commercial sources fabrics have been made from Orlon, nylon Dacron, Dynel, Acrilan, viscose, acetate, Vicara, wool, cotton and blends of various fibers in the list. Some of the fabrics produced from the above fibers were later used in the Dye department in reseach work.

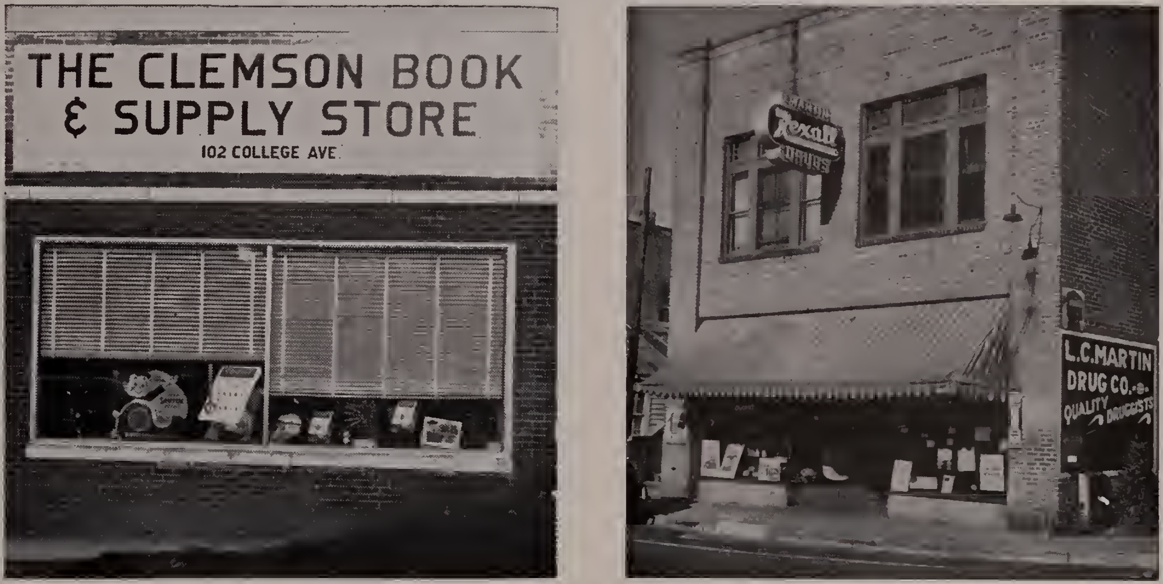
ESSAY CONTEST

(continued from page 12)

We know that the productivity of labor has risen greatly over the years. Some experts maintain that it is difficult to increase the production efficiency of the worker. Does this higher productivity mean that the worker has become more skilled, or that he works harder? It is mainly due to the greater managerial "know-how" and better machinery. A rearrangement of the mill, the use of more power, or new machinery installation may make it possible for a worker to double his output with less skill and less physical or mental effort than was required before.

At the exhibit mill management and personnel can learn of the new methods of production and improved machinery which is coming into the field. They can learn the new methods which are employed in the field which make for better working conditions that are essential with the higher class of labor now in the textile field. If the worker is to achieve a higher standard of living, he must have the opportunity to work under the most efficient working conditions. With these better working conditions comes less waste, better quality and more production from the operators. It is well known that people work more efficiently in more pleasant surroundings.

The modern textile industry is becoming so competitive that to stay in business and make a profit it is essential that the mill be able to put out the best quality, with the highest production, with the least



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possible cost. Textile men of today should recognize this valuable opportunity to exchange ideas open to them and take full advantage of it, for the textile industry in the United States is in danger of having its competitors in other countries undersell and outproduce them. To be able to compete with these countries we must improve our facilities. Their advantage lies in the cheapness of labor, but we must make up the difference in efficiency and better machines. Research in textiles is advancing in leaps and bounds and to get this better quality, larger production, and lower cost the mill must keep up with all the new inventions and thoughts.

Mr. Manning Mallory, Manager of Cheraw Cotton Mill, says, "Although you can read the same things in textile magazines, the exhibit is of immense help especially to the foreman level. It gives in a dramatic way, at one time and in one place, all the improvements in the textile industry. The exhibit in Atlantic City is larger, more complete, and better attended than the show in Greenville, S. C., and is an important aid of those attending are in all seriousness to learn just what is happening."

One can see that this exhibit has almost become a necessity to the industry, to keep pace with the demands of the consumer for quality at low price.

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Ramie in Florida

by
Davis T. Moorhead, T.M. '54

I'd like to tell a little about the wonder fiber Ramie, and its possible future in the economy of Florida. Florida, it has been proven, with its rich soil that the moisture can readily be controlled in, together with the semi-tropical climate, make it the best place in the United States to grow Ramie. It has enormous possibilities, and one day soon, when just one major problem is solved, it will make for an entire new industry in the Southern-most state.

During my stay in Mount Dora, near Zellwood, Florida during the Christmas holidays, I had the opportunity to spend some time with Mr. G. J. Hayslip, president of the now liquidated Ramie Products Corporation. He is recognized as one of the leading authorities on Ramie in the United States.

We will divide our discussion into several parts, leading off with agriculture. Ramie grows best in a fertile, moist, but well-drained soil, the type found in the vast peat areas (muck) surrounding Zellwood. The plantings of Ramie are usually made in May, June, July or August, there, the real summer months. It is planted in rows four feet wide with a distance of two feet between plants at a depth of 2½ to 3 inches. It can be raised from seed or root stock, but the reed produces a less uniform plant and takes longer, so root stock is usually chosen. During its first year Ramie is cultivated regularly, to enable it to develop over the weeds, which it kills itself when it gets started. In this first year of development, it is cut back two or three times, leaving the stalks in the field for fertilizer. It grows in stalks, reedy-like in appearance with the leaves forming a bundle at the top. Ramie belongs to the hemp family and more than sixteen varieties are known. Bohemia nivea is the only satisfactory source of ramie. The plant attains a height of from six and a half to seven feet, but some grow up to eight feet, depending on the conditions. A cross section of a ramie stalk shows a pithy center surrounded by a woody layer. This layer is in turn surrounded by the inner bark, which consists of the fibers embedded in gums and pectins. Some of the fibers are as short as two inches, but others may measure up to twenty inches in length. The average length is usually six to eight inches, however sleathing or covering the plant stalk on the outside is a thin green bark that becomes lower as the plant matures. Contained in this outer bark is a rich deposit of tannic acid, which is said to be the reason for its remarkable freedom from the common insect pests.

As stated before, ramie being a perennial plant, it will require almost no cultivation after the first year. Once you have planted it, it will come up year after year. The life length can be counted up to seven years, with other authorities claiming from twenty to thirty years. The planted root stock will sprout in about two weeks and attain about thirty inches in two months. After this first year of developing the growth is much shorter. The first crop is harvested in May, the second in July and the third crop in September, with about sixty days between cuttings. In the sixty days it grows the six and a half to seven feet stated. You get a heavier yield in these cuttings, because the frost covers the plants and forces them to rest during the winter months . The plant is cut with a modified mowing machine, made by International Harvester and bundled up like wheat stalks. The later the cuttings, the greater height attained under the growing conditions. Five or six cuttings could be made but three have proven most satisfactory. A cutting under reasonably good conditions can be expected to yield from 400-500 pounds of fiber an acre, or 1200 to 1500 pounds an acre for the year. An acre of land of Ramie yields about forty-five tons of green material a year, the amount of fiber is about 1.5 percent of this.

After harvesting, the Ramie is taken into the central plant by tractor and trailer to be decorticated (this means crushing the stalk and removing the fibrous outer bark for further processing). In Florida, the plants are sprayed with a process much the same as is used to deleaf cotton when it is picked by a mechanical picker, to remove the leaves and thus relieve the decorticating process of some of its bark. The Waldo Decorticator was formerly used but now it has been proven unsatisfactory because of the expense involved. The bundles from the field are placed on a conveyor, cut loose and spread out in a relatively thin layer. Then it is run into the blocks to be decorticated, the butt or bottom end first, and then the tops. Water is being sprayed on it all the time to wash over the pithy center and the woody part of the outside. It is then run through dyers and baled up. In Clewiston is a plant that staples the Ramie for use in the cotton and worsted systems. Now **here** is the only real problem that has not been solved. A satisfactory, but inexpensive decortication process. As stated before, the Waldo Machine is too expensive. Mr. Charles Short of Clermont, Florida has a machine completed, but is doing more work on it. A Mr. Godtel in Mount Dora is developing a decorticator that shows much promise.

Right now there are no appreciable Ramie plantings in the Zellwood District, but the holdings at Clewiston are going right ahead. The Sea Island Cotton Mills of New Orleans are blending Ramie with cotton to produce more wonderful materials. The main thing abut Ramie is the fact that it will **not** mildew and knot like so many natural fibers. It has very high strength, but the knotting strength is low due to its very high crystallinity.

A wonderful future can be made for Ramie in Florida. The reason that the holdings in ramie have decreased is the fact that there has been poor management, and **not enough capital** to put it over on the scale that is necessary. Muck lands and the climate there are a natural. When it is developed probably they will grow it, decorticate and degum it and weave it into cloth right there in Florida.

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WHO WANTS SHRINKPROOF WOOL?

(continued from page 9)

animal fibers are covered with tiny overlapping scales, not unlike those of a fish, with the sharp end pointing toward the fiber tip. If your fingers are sensitive enough, it is possible to feel these scales by pulling a coarse wool fiber between the thumb and finger. Pulled by the root end, the fiber seems to slide more readily between the fingers than when pulled by the tip end. This directional difference in surface friction, known as the "Differential Friction Effect," is responsible for the tendency of the fiber to travel, when flexed, in the direction of its root end. There are undoubtedly a number of important properties of the animal fibers which also play a part in felting shrinkage, but this seems to be the main one.

Shrinkage Control Methods

If the felting tendency of woolens is due mainly to the scale structure then it should be possible to minimize, or eliminate, the progressive shrinkage of wool by getting rid of the differential frictional effect. This can be accomplished by:

1. Removal of the sharp edges of the scale, making them essentially round.
2. Filling up the space under the sharp edges of the scale, producing the same effect as the removal of the sharp edges, but by an additive, rather than a subtractive process.

Removal Processes

With sufficient patience, fibers could probably be made non-felting by sandpapering them. This is not as far fetched as it seems; at least one inventor thought enough of the idea to patent it, claiming that the felting of woolen textiles can be reduced by working them with abrasive materials such as sand and powdered glass. Since the process was never commercialized, it seems safe to assume that the fabrics might be worn out by the treatment.

Another interesting process is related to meat tenderizing . It has been known for a long time that certain enzymes will digest proteins, such as meat and wool. One such enzyme is papain, the active ingredient in most of the meat tenderizer products which have been appearing on the market recently. Under the proper conditions, papain will dissolve the sharp edges of the scales and give excellent control of felting shrinkage, and this process was patented in Great Britain nearly 20 years ago. It is difficult to control the action of the enzyme, however, in such a way as to localize the damage at the fiber surfaces, and that portion of the enzyme solution which gets inside the fiber will work just like Adolph's Meat Tenderizer, considerably reducing the strength and durability of the fiber. Who wants to wear a sweater so tender you can cut it with a fork?

LUREX

The mushrooming use of metallic yarns in both fashion apparel and home furnishings, and the endless number of outstanding new designs they command, were impressively demonstrated recently at a showing of fabrics woven with Lurex non-tarnishing metallic yarns in the Atlanta-Biltmore Hotel.

The textile creativeness of the South's leading weaving mills was amply illustrated in the coordinated exhibit panels, and by a number of modeled apparel items from the tables of New York fashion designers.

Local mills and manufacturers represented included Jordan Mills, Deering Milliken, Chicopee Mills, Albert J. Bartson, Fincastle Fabrics, Cohama and Spinning Wheel Carpet Company.

Lurex, developed by The Dobeckmun Company of Cleveland, Ohio, can now be found adding a lustrous glow to everything from high-fashion fabric to rugged, yet glamorous, automobile upholstery, as the displays by the noted interior designer, Tom Lee, dramatically proved. The fine, supple yarn shows itself an adaptable companion to all fibers, natural or man-made.

The Lurex colors, ranging from gold and silver through the subtle porcelain tones and the newest multicolor yarns, are styled by Dorothy Liebes, noted colorist and textile designer, and consultant to The Dobeckmun Company. The diversity of the color story was brought to life in a dramatic fashion show which climaxed the important exhibit.

Fashion

Among the fashion fabrics displayed was the famed "Cloth of Gold" from the textile house Simon, Healey and Goldstein. The fabric is woven of 1/100" gold Lurex with sheer nylon and was shown in a gown by Philip Hulitar, the fluid lines emphasizing the supple quality of Lurex. Other fabrics shown were Fuller Fabric's "Alamo," blue and chartreuse cotton blended with Persian blue Lurex, for a fascinating iridescent effect, and Worumbo's worsted men's suiting, a grey plaid woven with Lurex. A fabric with special significance for Spring fashion was a nylon and Lurex "Horsehair" designed for petticoats and millinery—a loose weave of white nylon and sapphire blue Lurex.

Peggy Ives hand woven designs, woven in the famous designer's Ogunquit, Maine, studio, were represented by a blend of shocking pink Lurex and wool of the same color, shown in a striking cocktail skirt by Vera Maxwell, and a black and white check fabric, sparkling with Lurex, tailored by Craig into a man's waistcoat.

Many fashion accessories for both men and women, made from Peggy Ives metal-shot woolens, were shown on the accessory panel. Among them were men's ties, cuff links, women's handbags and scarves.

Other fashion highlights were Herbert Meyer's cotton fancies, particularly attractive blends of cotton and Lurex—dramatic and Oriental in Mood. In one fabric, this house blends red cotton and porcelain pink Lurex to achieve an unusually lovely effect. The beauty of the fabric was emphasized by skillful treatment in a Carolyn Schnurer play suit and jacket.

The daintiness of the new porcelain colors was shown to beautiful advantage in a rich satin-backed fabric, striped with glowing porcelain pink Lurex, from Catoir. The same fabric had an entirely different effect in a black silk with sapphire Lurex, from the same house.

Recently Lurex has been found making a discreet appearance in men's wear. Handsome evidence of the new fashion was an evening jacket from Craig Tailors, using Peggy Ives charcoal wool and silver Lurex. Other examples were jaunty vests by Craig, using a black and white check from the same weaver, and her blend of red wool and gold Lurex. Even men's suiting carries a restrained touch of silver or gold glitter, as the Worumbo grey plaid worsted and the Mooresville menswear fabrics illustrated.

Climax of the show was the animation of the complete Lurex story, thus far, combined in one glittering fashion show, done with the light touch. The non-tarnishing properties of Lurex were firmly established by an odorous comparison with a lame dress from the Tarnished Twenties, a museum piece fresh out of black tissue paper, and the new glittering fashions woven with Lurex.

Home Furnishings

The muted appeal of porcelain Lurex was shown by Dorothy Liebes' striking "sampler" called "Birthday Party." Here the combination of all six of the porcelain toned Lurex yarns demonstrates the delicate adaptability of the group. Her "Black Strie," a companion "sampler," told the new multi-color dramatically.

In a collection of Boris Kroll fabrics, some of them from the new Caribbean collection of upholstery and drapery fabrics just introduced, this designed makes use of Lurex yarns to give the effect of sun glancing off the sparkling surfaces of the Caribbean Sea, or to add muted brilliance to his tropical blue-green, warm yellow and pink weaves.

Important groups of furniture upholstered in these Kroll fabrics, such as Baker's "New World Group," John Widdicomb's "Mid-Century Modern," some new Dunbar designs by Edward J. Wormley, and some Jens Risom pieces are eloquent examples of how a deft use of Lurex adds handsome tonal quality to a weave.

A new casement cloth, "Bonnay" by Shulman-Abrash, shows Persian blue and jet Lurex delicately traced through a gossamer sheer plaid design.

Some of the applications of Lurex in the home furnishings field were beautifully shown in a series of display panels. How Lurex threads its way in the field of linens and domestics was well depicted in a group of table linens and guest towels. Felix Tausend's handsome "Festival" cloth using Lurex in a Celanese rayon damask weave and some textured mats from Leacock pointed up a skillful use of the metallic yarn. Again in this category, a striking new pattern from "Garden State Prints" showed silver Lurex giving a delicate highlight to a table cloth striped in confetti colors.

From Pentland Associates were some delightful guest towels and a luncheon set, both good examples of Lurex in its embroidery application.

Anne Seton's lingerie case and scuffs again illustrated the metallic thread as an important accent in the novelty designs in accessories.

An entirely different use of Lurex was noted in the Chromespun shower curtain from Joseph A. Kaplan, while "Drama," a fine wool broadloom, in beige, black, neutral and gold from Spinning Wheel Mills, available through F. Schumacher and Co., showed Lurex as a good companion yarn and fashion accent in the floor covering category.

Contract

Another expression of the use of Lurex in decorative fabrics was illustrated in the field of contract work. This was dramatized by two schemes, one, that of the newly decorated Sky Room, atop Miami's Columbus Hotel which William Pahlmann has done, and the other, the Dorothy Liebes fabrics for the S. S. United States, the great new superliner.

Mr. Pahlmann chose for the draperies a screen print designed by Howard Pederson. It is a bold architectural motif in shades of citron, brown and turquoise on Goodall's "Silverne" cloth, a fabric silver-shot with Lurex. For the upholstery fabric, Mr. Pahlmann used Goodall's "Gripsholm" cloth in tones of yellow with gold Lurex.

For the upholstery fabrics and draperies of the "United States," Mrs. Liebes used two jewel-toned Lurex metallics, emerald green and sapphire blue, blending in colors of the sea. Other jewel-toned Lurex was used in the great curtain Mrs. Liebes designed for the ship's theatre, and in the dramatic and famous Liebes blinds in the same sea-tone colors.

One of the highlights of the contract exhibit was a group of 100% saran fabrics combined with Lurex. Called "Chic-spun," this revolutionary new industrial fabric has a monofilament saran warp with spun saran fill and porcelain white, red, or silver Lurex. Manufactured by the Lumit Division of the Chicopee Mills, the fabric is in wide demand for institutional type interiors in particular. Due to its saran and Lurex weave, it is easily washed right on the furniture, and can take disinfectant spraying necessary in hospital installations.

Automotive

One of the newest groups to be added to the Lurex picture is a collection of automotive fabrics for both upholstery and seat covers. Highlighting this group were two fabrics from Goddall, used by Lincoln and Studebaker respectively.

General

Since its introduction in 1940, Lurex has been improved as to color fastness of the yarn and continually made finer and more supple. But even more newsworthy are the advancements in color styling. Multi-colored yarn is a goal Dobeckmun has long striven for and only recently attained. As many as five colors can now be printed on a single yarn—and the color combinations are limitless.

Several examples were shown both in fashion fabrics and upholstery and drapery cloths.

The enthusiasm which the porcelain colors have been received since last Fall has found its outlet in some of the most intriguing designs shown at the Manor House. These chalky, opaque colors are soft and muted, adding shimmer rather than glitter to fabrics — an undertone rather than an overtone of color.

The original gold and silver Lurex yarns, still the most widely used, were followed by the introduction of brilliant "jewel" colors, opening new design possibilities. Jet black, bronze and gunmetal colors were the next development, bringing to the Lurex color palette a dramatic sophistication that gave it still wider scope.

With these continuous color developments, under the guidance of Lurex consultant Dorothy Liebes, designer interest has grown steadily and drawn Lurex into every aspect of fabric design.

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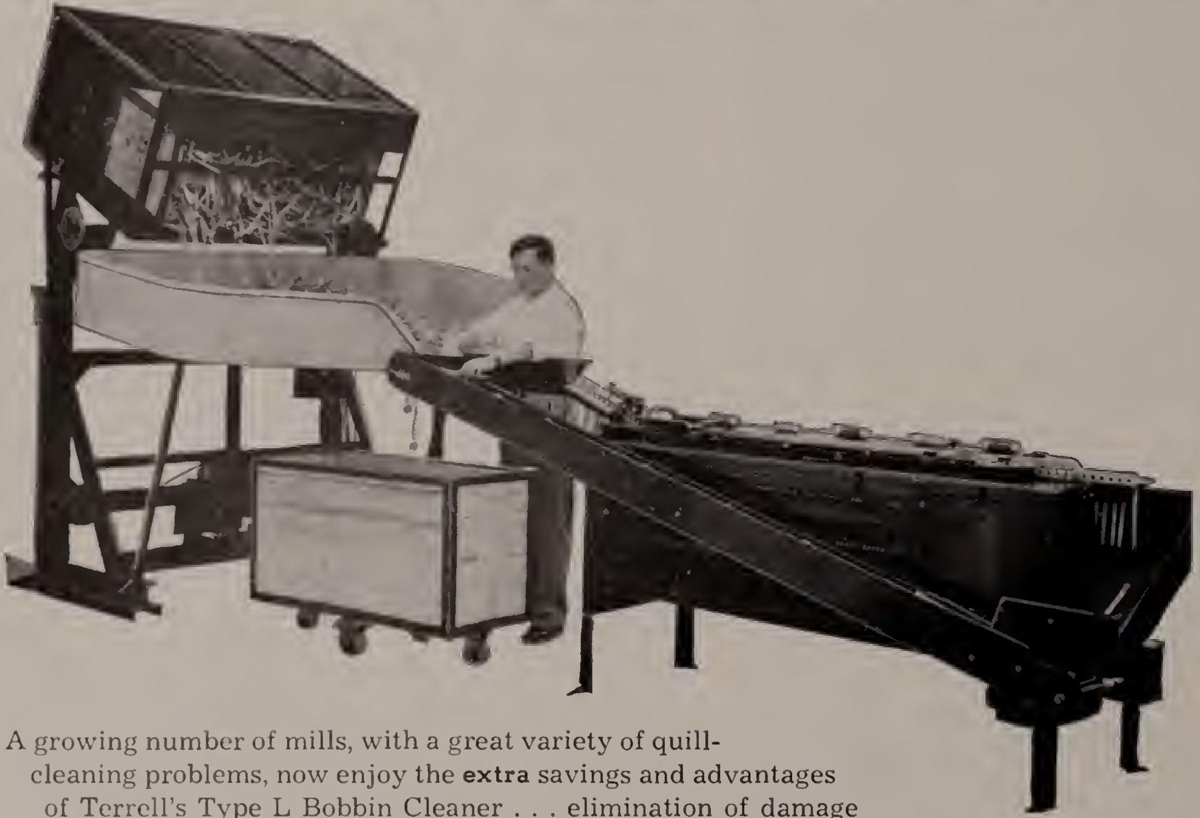

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SHRINKPROOF WOOL

(continued from page 19)

Quite a number of processes which utilize the oxidizing action of such chemical compounds as sodium hypochlorite to destroy the sharp scale edges have met with a fair degree of commercial success within the past 10 years. That chlorine and other oxidizing agents can be used to eliminate wool felting has been known for about a hundred years, but not until relatively recently were such processes used commercially.

Properly conducted, the chlorination of wool gives excellent stabilization with a minimum of damage. Present wet processes all depend on a careful control of chemical concentrations, temperature, and time of exposure, and despite the necessity for close control, they do not offer unusual difficulties in the plant. Several million yards of chlorinated woolen fabrics have been purchased by the Department of the Army since the end of World War II: the Government indeed, has probably been the best customer for washable woolen items to date.

Chlorination is probably the least expensive of all stabilization processes. Exclusive of patent royalties, the cost of processing, including chemicals, should not exceed five cents per pound of wool. Processes used in the United States today are of both the continuous (Harriset and Scholerize), and batch types (Sanforlan and Scholerize).

Despite their low cost and relatively easy application, chlorination processes are deficient in certain respects:

1. The wool, however carefully it is treated, suffers some loss in weight and is somewhat damaged.
2. The natural water repellency of the wool is reduced. Chlorinated woolens are more readily wetted than comparable untreated fabrics, and this is usually undesirable.
3. Chlorinated wool usually feels harsher than untreated wool.
4. It is difficult to treat heavy fabrics such as blankets uniformily. By the time that fibers inside the fabric are adequately treated, those on the surfaces are likely to be considerably damaged.

Yet another removal process, involving treatment with caustic soda in such solvents as alcohol and naphtha, has been patented by the Tootal-Broadhurst-Lee Company of England. Wool is readily attacked by caustic soda, and the shortcomings of this type of treatment are similar to deficiencies of chlorination. So far as is known, the caustic treatment has not been employed commercially in this country.

Additive Processes

Patent literature on the subject of additive wool shrinkage control processes reveals a considerable array of materials which may be used for filling in the valleys beneath the scales to eliminate the differential frictional effect. Most are classed as resins, and while many have been studied, only the melamine resins have been used in substantial volume for wool stabilization. Resins of this type are sold under the trade names "Lanaset" and "Resloom."

As supplied, the melamine resin is normally a clear solution in water, containing from 65 to 80 per cent solids. In the original process, this concentrated resin was diluted to the appropriate concentration (usually 10 to 15 per cent solids) with water, a catalyst was added, and the solution was applied to the fabric by padding. The wet, resin-impregnated, fabric was then dried and heated to relatively high temperature, usually in the neighborhood of 300° Fahrenheit, for a few minutes. At the high temperature, the catalyzed resin become hard and permanently insoluble. It will then withstand repeated launderings without removal from the wool and, when properly applied, controls shrinkage quite well.

More recently, this process has been largely supplanted by a new, and better one, known as the "acid colloid" treatment. The same starting resin is used, but in the acid colloid treatment, the resin is partially cured before it is applied to the fabric. The acid colloid is prepared by treating the resin, before applying it to the cloth, with acetic or glycollic acids. The resin changes, after ageing for several hours, from a true solution to a partially polymerized colloidal dispersion of submicroscopic resin particles. This dispersion, when applied to the fabric as before, cures at lower temperatures, and less resin is required to achieve good fabric stability. A considerable yardage of both consumer and military fabrics has been treated by both of the melamine resin processes.

It would probably be somewhat simpler to list the resins which have not been recommended for wool shrinkage control, rather than those which have. Most of the additive treatments, other than the melamine-formaldehyde resins, are applied to the wool either as water emulsions or solvent solutions of the fully polymerized resin. Such treatments do not normally require heat curing, and their application involves simple padding with a resin dispersion of the appropriate concentration, followed by drying. Some of the emulsion treatments involve an exhaustion of resin onto the fiber surfaces, and require that the padded fabric be allowed to stand in the wet state for several hours to develop the necessary washfastness. Following exhaustion, the fabric may be rinsed and neutralized before drying.

The new Australian SI-RO-FIX process achieves shrinkage control by the application of a chemically-modified nylon to the wool from an alcohol solution. Excellent shrinkage control has been reported, and the process is now being evaluated by a number of mills in this country. The disadvantages of solvent treatments in finishing plants are well known, and will probably be an obstacle to the widespread acceptance of this process.

While they do not generally damage the wool, additive treatments also have their drawbacks. The most serious of these is probably the tendency of the treated fabrics to feel stiff. Due to incomplete removal of the resin solution from between the fibers during padding, some fibers become bonded together during drying. This stiffening, which can be minimized by using a heavy squeeze pressure in padding, is quite undesirable and very difficult to eliminate entirely. Softeners are occasionally helpful in restoring some of the original hand, but they are not very fast to laundering. The emulsion treatments generally give a better hand than either the melamine or solvent solution resins, but the fabric can hardly be overemphasized, and accounts in no small measure for the lack of widespread consumer acceptance.

Color Problems

The control of felting shrinkage is but one of the problems which must be overcome in producing washable woolens. Of almost equal importance is the question of selecting dyestuffs which will have the desired brightness of shade and the necessary washfastness. Wool dyes of the conventional acid type are not well suited for the dyeing of fabrics which are to be laundered repeatedly. With few exceptions, they bleed badly on laundering.

Two classes of wool dyes have much better washfastness than the acid dyes; these are the chrome and metallized colors. Although considerable progress has been made in developing washfast dyes of these classes for wool, it is not yet possible to obtain a full range of bright shades and the color range in washable woolens is at present much more limited than it is in non-washable lines. This situation is steadily improving, but dyestuff selection for washable woolens will probably be a major problem for some time to come.

If woolen fabrics are to be supplied in a washable condition to the garment manufacturers, it is of course, necessary to reduce relaxation shrinkage to a minimum before cutting or sewing. Today, no method comparable to the sanforizing process is available for removal of relaxation shrinkage from woolens and the best results, usually obtained by over-feed drying, are by no means so good as those obtained in the sanforizing of cotton materials. Because of the looser construction of woolens, it is most unlikely that shrinkage tolerances can ever be reduced as low as those of cotton. Reduction of relaxation shrinkage to a minimum is, nevertheless, a must for washable woolens.

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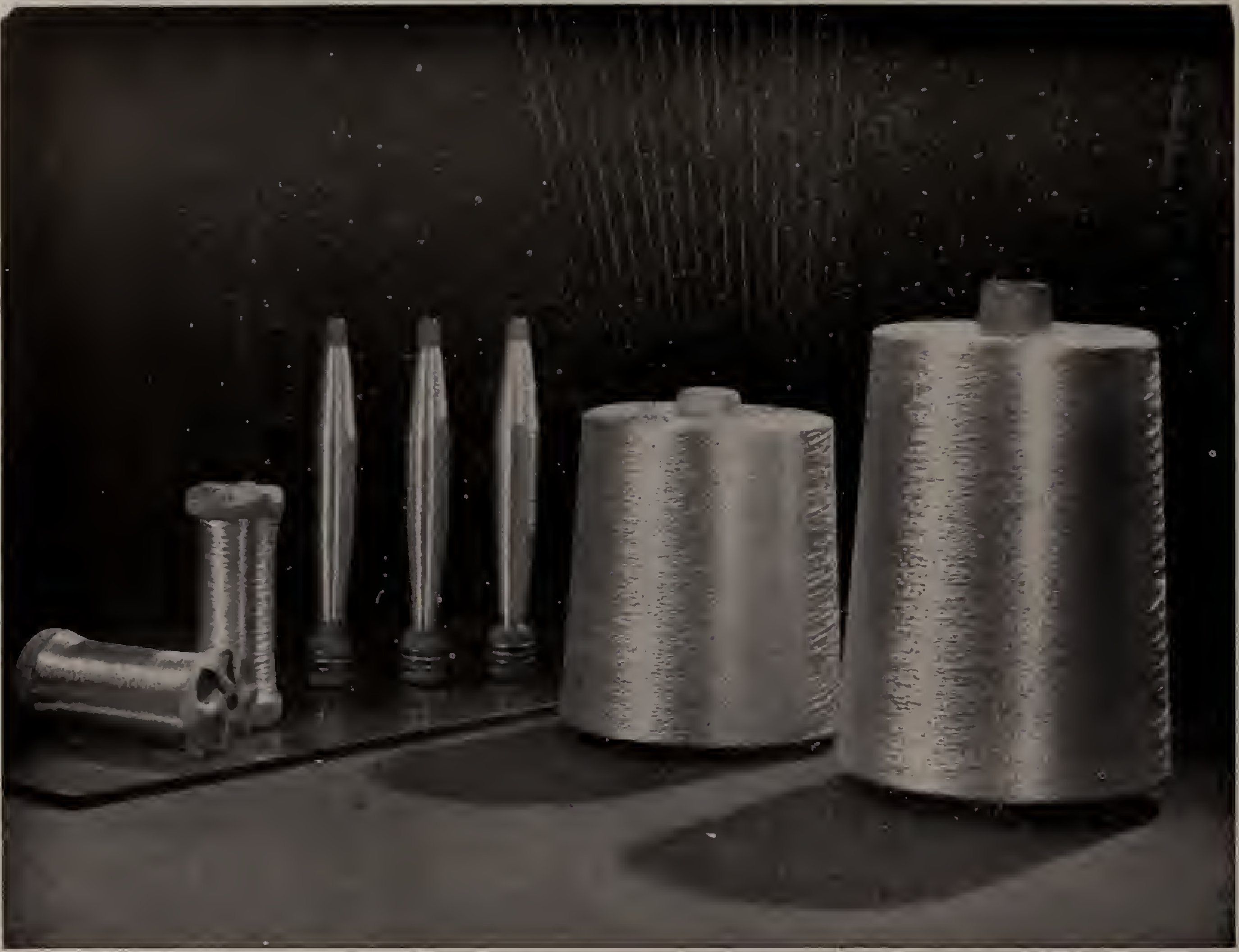

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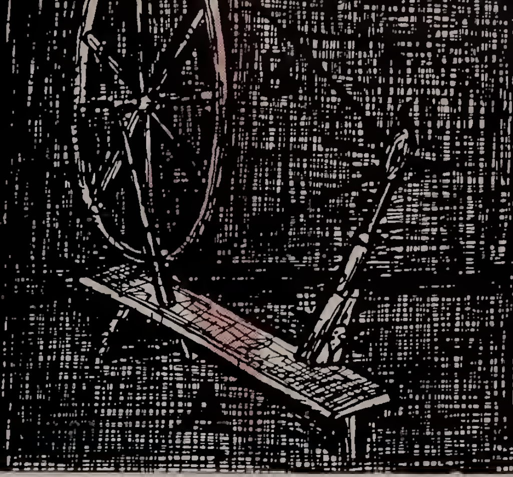

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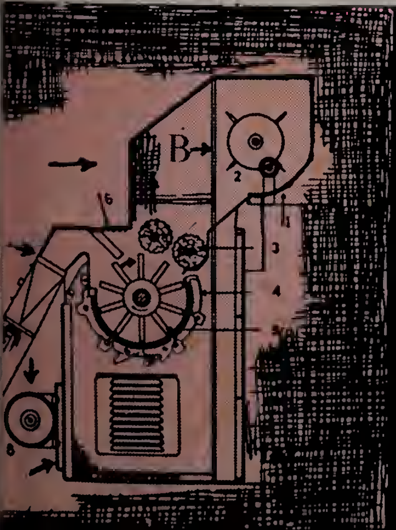

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A New Survey:

Earnings of Textile Graduates

R. G. Carson, Jr.
Associate Professor of Textiles

Dr. Carson is a graduate of Clemson, receiving his B.S. in Weaving and Designing in 1939. Since then, he has done graduate work at Georgia Tech where he earned his M.S. in Industrial Engineering in 1950, and in 1953, received his Ph.D. in Industrial Engineering from Michigan State.

Professor J. H. M. Beaty offered the first textile course at Clemson during the fall of 1899, in the upper half of the original Textile Building. The first class graduated during 1900. In the years since then, the other half of the old Textile Building, now the Physics Building, was added, then later the school moved to its present modern building. Since that first class of four men, over 2,000 other men have received degrees from the Clemson School of Textiles, and numerous others have participated in short courses or enrolled as special students.

Last fall, the school began a study of its graduates. The Claude W. Kress Research Endowment Fund provided money for postage, printing, and some clerical work to help carry this project out. Information was obtained from over a thousand graduates. This represents about 63% of those with known addresses, and over half of all the men who have received a degree from the Textile School. Compilation of all the results will not be completed for several months yet, but some information about earnings is available at this time. Since this information will be of interest to so many Clemson men, a report of this part of the study is being made and distributed through the Bobbin and Beaker.

Table I shows the number of graduates, by degrees, for each year since the beginning of the school. In 1933 the Textile Industrial Education Curriculum was transferred to the School of Education so the degrees of the last fourteen men in this column of Table I were administrated by the School of Education. All the others were under the auspices of the Textile School. It is interesting to note that more men have graduated in the last seven years (1043 men from 1948 through 1954) than in the first forty-eight years (992 men from 1900 through 1947). This illustrates dramatically the growth of Clemson College and the Textile School during recent years. At the present time, the school is operating at the level of 115 to 130 graduates per year.

Year	Textile Industry	Textile Industrial Education	Weaving and Designing	Textile Chemistry	Textile Engineering	Textile Manufacturing	Total
1900	4						4
01	9						9
02	17						17
03	21						21
04	5						5
1905	5						5
06	7						7
07	1						1
08	0						0
09	0						0
1910	2						2
11	13						13
12	11						11
13	10						10
14	4						4
1915	11						11
16	11						11
17	4						4
18	4						4
19	7						7
1920	5						5
21					11		11
22					17		17
23					16		16
24		1			19		20
1925		22			10		32
26		12			8		20
27		6			8		14
28		5			11		16
29		7			8		15
1930		5		1	13		17
31		7	2	4	16		29
32		3	1	13	9		26
33		2	2	15	13		32
34		0	3	10	11		24
1935		0	5	11	12		28
36		0	4	16	16		36
37		2	5	8	26		41
38		4	5	11	31		51
39		0	3	8	33		44
1940		2	2	9	44		57
41		2	5	16	65		88
42		2	4	12	43		61
43		2		11	35		48
44				0	0		0
1945				0	3		3
46				1	18		19
47				7	67		74
48				8	100	8	116
49				18	31	113	162
1950				12	45	159	216
51				11	19	138	168
52				6	22	125	153
53				7	26	79	112
54				8	18	90	116
Total	151	826	42	223	825	712	2035

Table I: Clemson Textile Graduate, by degree, 1900 through 1954

Usable information about earnings during the year 1953 was received from 857 graduates, ranging from the class of 1901 through the class of 1952. The class of 1953 had not been out in the industrial world long enough to furnish useful information in this respect. In evaluating the results of earnings information, the following factors should be kept in mind:

1. There were few graduates in the early years (1900-1920). Therefore, the sample for these years was very small, and some men who had earned high salaries previously were retired during 1953.

2. Most of the recent graduates have served a tour of duty with the Army or Air Force. This has delayed their entrance into industry and probably caused progress to be a little lower during the first few years out of school than it would otherwise have been.

3. The information was gathered by mail. An initial letter requesting information and a return envelope were sent out. A few weeks later, a follow-up letter was sent to those who had not already replied. It is possible that a greater proportion of the successful men than unsuccessful men sent in information. This could only be checked by actually interviewing a representative group of those who failed to answer and comparing their status to that of those who did answer.

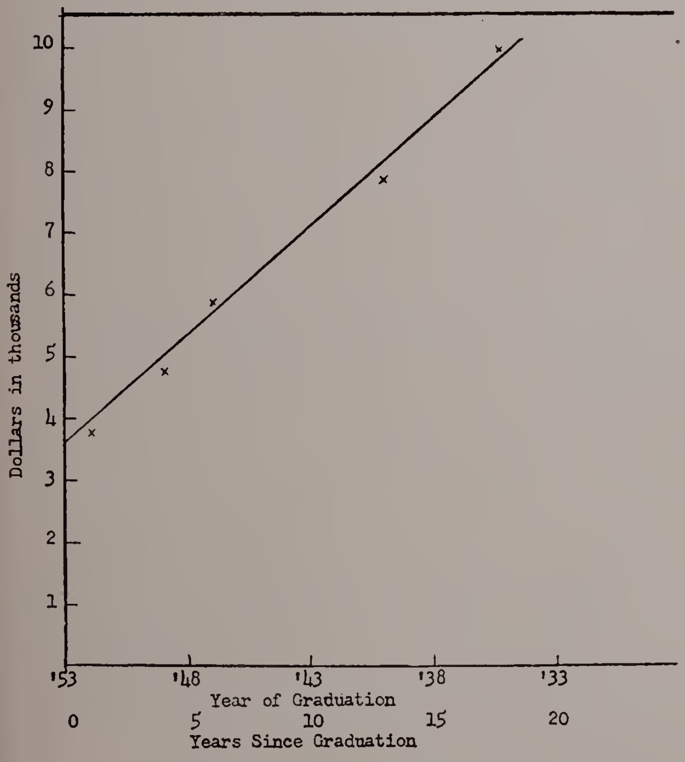

Figure 1: Minimum Earnings of more than fifty per cent of the class.

As a result of these factors, there may be some bias in the figures shown, but on the whole, they are probably representative of Clemson Textile School Graduates.

Figure I gives a measure of progress of graduates by class. The line shows the approximate point at which at least fifty per cent of the class reported annual earnings higher than the amount shown. Thus, seven years after graduation, at least fifty per cent of the group made more than $6,000 per year, and nineteen years after graduation at least fifty per cent of the group was making more than $10,000 per year.

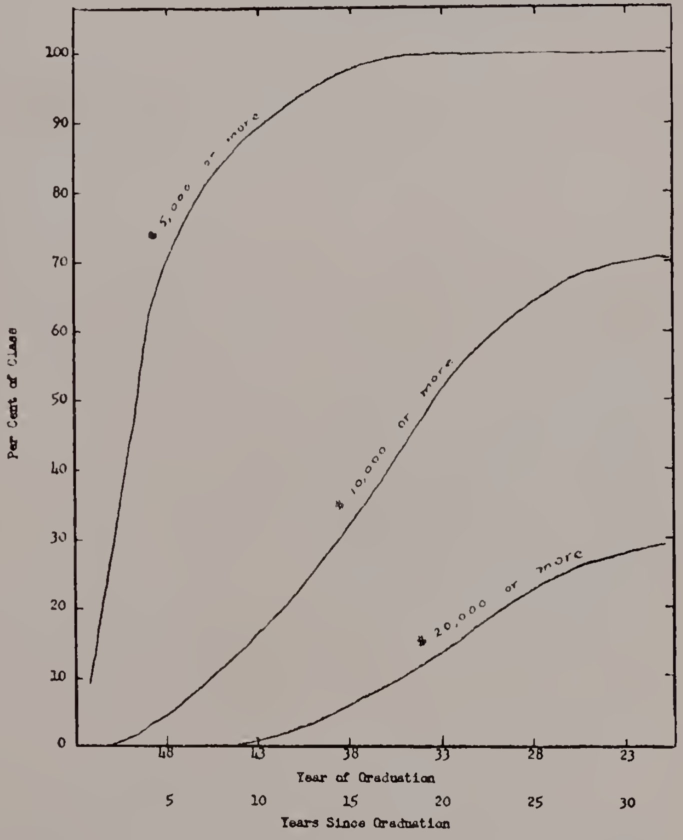

Figure 2: Per Cent of Class with Minimum Earnings of $5.000, $10.000 and $20.00 during 1953.

Figure 2 shows the per cent of each class making more than a specified amount. For example, line "C" shows that about fourteen per cent of the class of 1933 (out of school 20 years) is making more than $20,000 per year.

It is interesting to look for a moment at the 333 graduates from 1901 through 1940 who furnished sal-

(continued on page 13)

Another Example of the Continuous Growth at Clemson:

The Establishment at Clemson of a Cotton Ginning Laboratory

By M. C. Morgan, Textile Manufacturing Student

The establishment of a Cotton Ginning Laboratory was authorized when Congress included $100,000 for such purposes in the Agricultural Appropriation Bill. The late Senator Maybank sponsored the $100,000 provision with an understanding that the laboratory would be placed in this state.

In selecting Clemson for the laboratory, the Agriculture Department emphasized its central location for service to all the southeastern cotton growing states. A land-grant college location was selected because this provides opportunity to unite the ginning research with the related studies of cotton.

Other advantages of a land-grant college location are: available library facilities, opportunity for advancement of staff personnel, and consultation with workers in related fields.

It is toward solution of ginnning problems of the southeast as they are related to the mechanization of cotton production operations that work of the new branch laboratory will be directed.

Engineering Advantages

Clemson being centrally located, has a well-established School of Textiles and other facilities for engineering work on cotton production and processing. The professional staffs in these related activities will be immediately available for consultation on problems of the laboratory. Closely related fiber testing and spinning work of the agricultural marketing servce of the department are also located at Clemson.

The new laboratory will be operated as a branch of the main U. S. Cotton Ginning Laboratory of the Agricultural Research Service at Stoneville, Mississippi. This laboratory, in operation for more than twenty-five years, has become a world center of research in cotton ginning.

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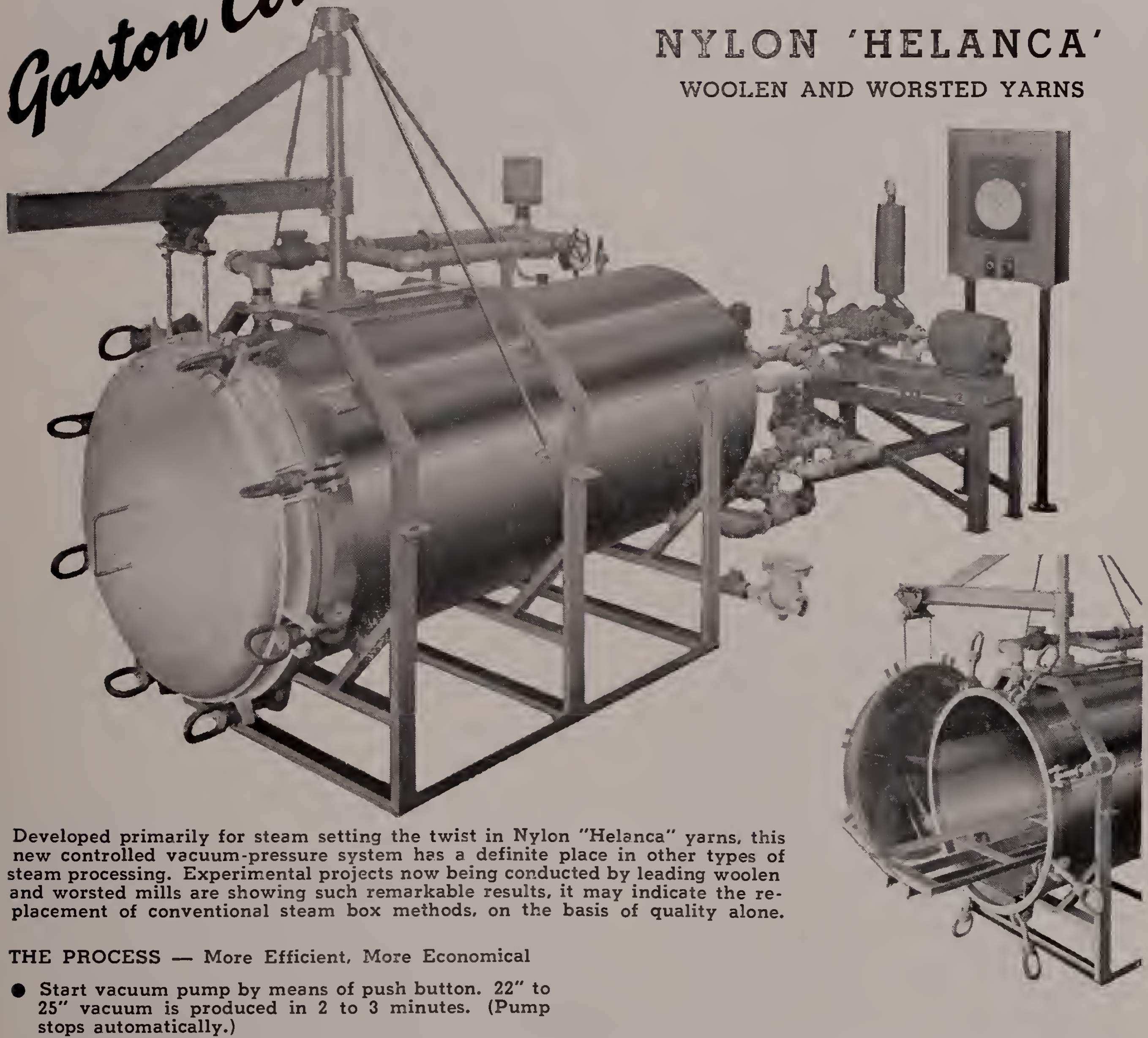

Developed primarily for steam setting the twist in Nylon "Helanca" yarns, this new controlled vacuum-pressure system has a definite place in other types of steam processing. Experimental projects now being conducted by leading woolen and worsted mills are showing such remarkable results, it may indicate the replacement of conventional steam box methods, on the basis of quality alone.

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On 66,600 spooler bobbins the test showed 9% reduction of reties for yarn from frames with underframe cleaners.

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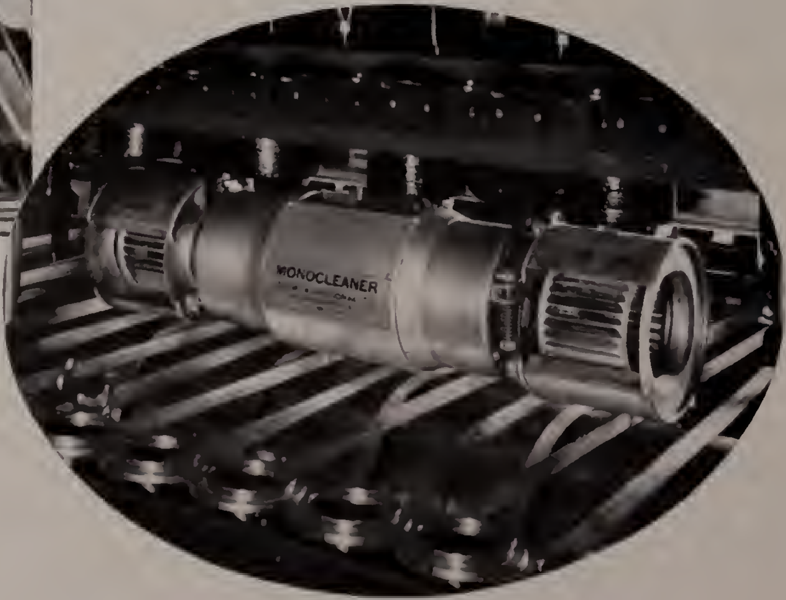

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The Age-Old Question:

Double Creel or Single Creel Spinning

This project was conceived and supervised by Gaston Gage, Head, Yarn Manufacturing Department, School of Textiles, Clemson College. It was planned by Gaston Gage and Howard L. Loveless, formerly Assistant Professor, School of Textiles. The project was approved by Dean H. M. Brown. The project was run and the data assembled by Howard L. Loveless, who was paid for running the project by the Sirrine Foundation. This article was written by Gaston Gage. Utica-Mohawk Cotton Mills, Division of J. P. Stevens & Co., Inc., furnished the roving for the carded cotton test and Textron Southern furnished the sliver from which the Rayon blend roving was made.

Which is better on the spinning — to run double creel with a high draft, or single creel with a lower draft? There is no question here of changing yarn numbers or hank roving, simply a question of double creel or single creel with the draft necessary to make the original yarn number.

As an illustration, suppose you are now making 2.00 hank roving and making 30's yarn. Which is better to use, double creel with a draft of 30 or single creel with a draft of 15, roving and yarn staying the same in both cases?

We did some work on this at the School of Textiles at Clemson College during the summer of 1954. We used a Model F2 Whitin spinning frame on which we could get a range of drafts from 10 to 60. Two different rovings were run on cotton and one roving on a rayon blend.

One of the cotton rovings was made from Amsak cotton, combed and run into 1.80 hank roving. It was spun into four yarn numbers and in each yarn number two twist multipliers were used. The drafts used were in combinations of 15 and 30 to make 25's yarn, 20 and 40 to make 33's yarn, 25 and 50 to make 41's yarn and 30 and 60 to make 50's yarn. The twist multipliers were 3.00 and 4.00.

The second cotton roving was made from carded cotton made into 1.00 hank roving. The cotton used was Middling color, SLM leaf, 1 1/16 staple, 25% El Paso irrigated, 75% Delta rain grown. The same draft program was used making 14's, 19's, 24's and 29's yarn. Twist multipliers of 3.50 and 4.50 were used.

The third roving was a blend of 50% 3.0 denier, 1 1/2 staple viscose, 35% 1.5 denier, 1 1/2 staple viscose and 15% 3.0 denier, 1 1/2 staple nylon. It was approximately 1.00 hank roving. The same draft program was used except that the draft combinations of 10 and 20 were added in the case of one of the twists. Twist multipliers of 3.25 and 4.25 were used.

One side of a 36 spindle spinning frame was used, this giving 18 bobbins in each test. All of the yarns ran so well that nothing could be learned about ends down. Most of the doffs of 500 yards each never had an end down.

The tests used on all yarns were the skein break, the single strand break, and the Per Cent Mean Linear Unevenness on a Uster tester. Because the results of the Uster Tester, which integrated over a 2 1/2 minute period, showed no difference in uniformity, some of the yarns were run on a Brush tester at 10 yards per minute and an "effective sensitive length" of one foot. Some of the yarns were run on appearance boards, but because no one could tell any difference in the appearance of the yarns, this was discontinued.

In each test the frame was set up for the proper draft with double creel roving. A doff of 500 yards was run. Then one end of roving was broken back and a draft gear with twice as many teeth put on the frame and the single creel doff was run.

The table shows the results of the test. In twenty-three tests out of twenty-five, the low draft, single creel yarn shows the better single strand break. In twenty-two cases out of twenty-five, the single creel shows the better corrected skein break. In none of the other cases is the difference in favor of double creel significant.

As stated before, there is no significant difference in uniformity as measured by the Uster Tester. In the four cases where the Brush tester was used to show short term variations, the yarn from single creel roving gave the better results.

As might be expected, it showed all through the test that the higher the drafts, the more the advantages in favor of the single creel, both on the single strand break and the skein break. All of the instances which did not favor single creel were in the low draft range.

Another trend that we cannot explain is that the higher twist multiplier always gave a greater score in favor of the single creel roving. The answer to why this is so may come in some future work.

In conclusion, the results of this test show that under all conditions run on the test, you certainly will do no harm to run spinning single creel with the low draft instead of double creel with the high draft. In practically all cases the yarn will be significantly better and in no cases will it be significantly worse.

The exception to this general conclusion is that in very low drafts and low twists, double creel roving and the higher drafts might be better, especially on rayon and other synthetic fibers where low drafts are apt to be used.

The manufacturing cost as far as the production of roving will be the same because the same hank roving is used in both cases. The number of bobbins to be creeled into the spinning frame will be the same so this cost does not change.

There will be only as much stock tied up in the spinning creels so this should be a saving. It will take about half as many roving bobbins to operate so this should be a saving.

Using a single creel also means a less crowded creel, possibility of larger roving bobbins and easier cleaning.

It is a relatively simple test for any mill to run. If you are now using double creel roving, simply break back one end and put on a twice larger draft gear and compare yarns. If you are now running single creel, set it in double creel and put on half as large draft gear and compare the yarns. This will take care of your peculiar situation.

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Stock Run Twist Mult.	Yarn No.	Sgl Cr.	Dbl Cr.	Sgl. Cr.	Dbl Cr.	% Incr.	Sgl. Cr.	Dbl Cr.	Incr.	Cor. % Incr	Sgl Cr.	Dbl Cr.	Sgl Cr.	Dbl. Cr.	% Incr.
Carded	14.2	15	30	608	596	2.0	176	170	3.5	1.4	12.7	12.9			
Cotton	19	20	40	455	435	4.6	120	119	.8	- .2	14.3	14.4			
T.M. 3.50	24	25	50	367	336	9.2	92.5	88.5	4.5	1.9	15.1	16.3			
	29.3	30	60	275	254	8.3	71	67.5	5.2	2.3	16.0	16.3			
Carded	13.8	15	30	696	611	13.9	181	167	8.4	6.9	12.3	13.1	46	50	8.0
Cotton	18.4	20	40	506	455	11.2	126	117	7.7	6.6	14.2	14.6			
T.M. 4.50	24.0	25	50	388	352	10.2	95.5	89.5	6.7	4.0	15.3	15.6	57	67	14.9
	28.4	30	60	305	271	12.5	77.0	65.5	17.6	14.3	16.6	17.6			
Combed	25	15	30	582	558	4.3	159	159	0	- .4	10.2	9.9			
Cotton	33.4	20	40	442	426	3.8	116	114	1.8	1.7	11.0	10.9			
T.M. 3.00	41.6	25	50	341	328	4.0	89.5	85	5.3	2.1	12.0	11.6			
	51	30	60	263	247	6.5	71.5	64	11.7	9.4	12.2	13.6			
Combed	24.3	15	30	612	534	14.6	162	141	14.9	14.0	10.3	10.0			
Cotton	32.5	20	40	443	393	12.7	113	100	13.0	13.0	11.0	10.7			
T.M. 4.00	40.2	25	50	347	308	12.7	87	79	10.1	8.2	11.9	11.6			
	49.8	30	60	277	241	14.9	67.5	60	12.5	12.1	12.1	12.0			
Rayon	14	15	30	506	535	-5.4	133	137	-2.9	.6					
Blend	18.8	20	40	376	364	3.3	92	90.5	1.7	1.7					
T.M. 3.25	23.9	25	50	369	361	2.2	65.5	64	2.3	5.0					
	29.0	30	60	214	206	3.9	49.5	44	12.5	12.9					
Rayon	8.9	10	20	803	806	- .4	220	226	-2.7	-1.9					
Blend	13.6	15	30	504	491	2.6	126	125	.8	1.5					
T.M. 4.25	18.2	20	40	369	361	2.2	87.5	84	4.2	5.3					
	23.4	25	50	277	259	6.9	63.5	59	7.6	8.5			47	54	13.0
	28.2	30	60	208	192	8.3	47	40.5	16.0	16.0			53	62	14.5

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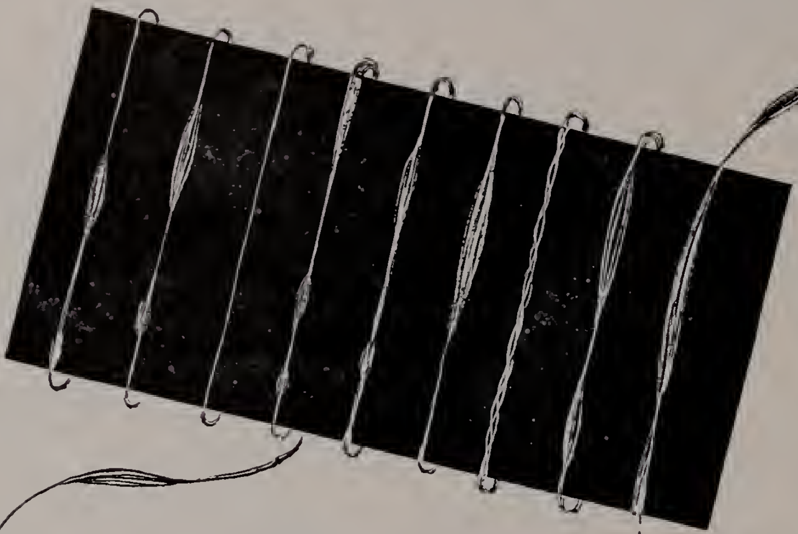

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Short Nubbi

High-low, non-mechanical, short entangled slub, irregular in size and spacing. (Also specials running part slub, part smooth). 75 – 800 deniers. As filling with acetate, silk, or chromspun. Lower deniers in dress and blouse fabrics; heavier deniers for draperies, upholstery, bedspreads.

Type "B" Cupione

Longer, entangled slub, irregular in size and spacing, but mechanically controlled for the Douppioni silk-look. 50–450 deniers. Filling for dress and blouse fabrics.

Long Type "A" Slub

Long, parallel, non-entangled slub for the true thick and thin look. 275 – 2500 deniers. Exceptionally soft hand. As filling, in lower deniers, for dress and blouse fabrics; heavier deniers for upholstery, draperies, bedspreads.

Type "C" Long Slub Warp Yarn

Long thick and thin, similar to Type "A", but filaments are more closed, making it suitable for warp or filling. 150 – 450 deniers. Used both warp and filling for dress and blouse fabrics – as warp with any filling, including Bemberg Nubbi yarns – or plied with spun flake yarn for smart men's suitings.

Measle Yarn

Part tight, part loose filaments with different shrinkage . . . forming loop or boucle effect. In weaving, loops break through surface of fabric for decorative dot effect. 400 – 3000 deniers. Lower deniers as filling in dress and blouse fabrics; heavier deniers for upholstery, draperies, bedspreads.

Strata Slub • Multi-Strata Slub • Dream Slub

Torpedo-shaped slubs spaced: Strata, 9′ apart; Multi-Strata, 6′ apart; Dream, 18″ apart. 150 – 5000 deniers. As filling in fabrics for upholstery, draperies, bedspreads.

Flake Slub

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EARNINGS OF TEXTILE GRADUATES

(continued from page 5)

ary information. Of this group, fourteen per cent made more than $20,000, forty-eight per cent made more than $10,000 and 69 per cent more than $8,000 per year during 1953. Table II gives the breakdown by earnings range for this group.

Earnings	Number of Graduates	Per Cent of Graduates
less than $4,000	7	2.1
$4,001 - 5,000	10	3.0
5,001 - 6,000	20	6.0
6,001 - 8,000	66	19.8
8,001 - 10,000	71	21.4
10,001 - 15,000	78	23.4
15,001 - 20,000	34	10.2
20,001 - 30,000	26	7.8
over 30,000	21	6.3

Table II: Earnings in 1953 of Textile Graduates from 1901 through 1940.

Further information is being tabulated on the type of jobs now held by textile graduates. During this phase, the proportion of textile graduates who remain in the textile or a closely allied field will be determined. The proportion of these in line management jobs, staff or technical jobs, and purchasing or sales will also be determined.

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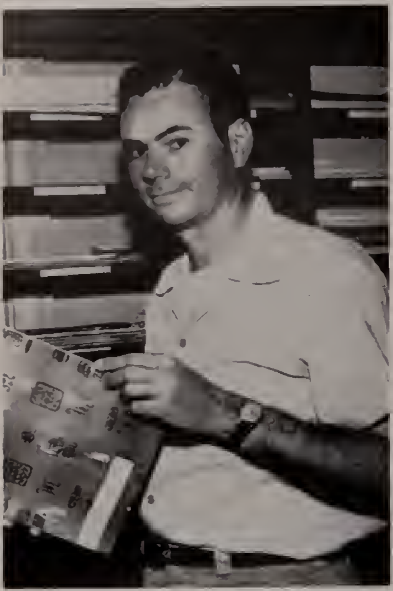


The Textile Industry Has Many Problems

By J. H. Marvin, Assistant Professor
Yarn Manufacturing Department

Textile manufacturers are striving to produce their goods at a pre-determined cost and deliver them satisfactorily to the customer. Each mill has its own problems, however, many are similar among the various types of mill operations. In order to be more specific, let us think of a mill making ladies cotton dress goods of different styles and patterns.

Some of the general problems are found in any industry. A summary of the problems would be as follows: (1) securing the baled cotton, (2) planning and controlling the flow of the stock, (3) processing the stock properly, (4) supervision of the personnel, (5) controlling the cost, (6) upkeep of equipment, buildings and machinery and handling of supplies, (7) handling of the payroll and personnel work, (8) keeping necessary records of all the mill activities.

If we try to picture the mill in operation, we can bettter understand and define these problems. There are hundreds of machines and various equipments. Also these machines will be of various types because of the different processes throughout the plant. Approximately twenty-five different types of machines are used and the number of each depends on the particular process.

The kind of cotton that will make possible the cloth quality desired will be selected. The cotton fibers in the bales will be a definite size suitable for this type of goods. These bales will be secured by dealing with the cotton market. Upon their arrival at the plant they will be checked and stored until needed for processing.

Plans are made to equalize the flow of the stock through the mill so that the cloth order can be filled on a promised date. This will require each phase of the processing to be readied and occupied with the right amount of stock and completed on time. Here we are concerned with changing the baled cotton into yarns and preparing them for the weaving of these yarns into cloth. As I mentioned already, it takes many kinds of machines to handle the stock in changing it to different size yarns from a bale. The movement of the stock from one process to another requires many various types of containers and transport equipment.

Quality work throughout the mill is another daily problem. Both the mechanical and the human element is involved here. Each machine has to be set up to do its work properly. Some will require mechanical changes for making the yarns and cloth according to specifications. Everyone is also concerned with keeping the amount of stock waste to a minimum.

The supervisors have a big job in directing the work of the personnel responsible to them. The duties of each person are explained for the carrying out of the production plans and machine operations. This work, of course, has to be done effectively in order to meet the quality and cost of requirements.

The machinery requires careful daily servicing for keeping it operating properly. Certain repairs will have to be made as needed. Some parts of the machines will require replacement. There are times when new cost-saving machinery will be needed to replace the present machines. The buildings require the usual upkeep, such as painting. Over a period of years, building additions or improvements may be needed.

The purchasing and distribution of supplies is another problem connected very closely to this part of the operation. The keeping on hand and issuing them as needed is another daily task that requires systematic requisitions.

The payroll has to be made every week for each employee to receive their earnings. The information is obtained and the amount determined to be paid each job according to the work performed.

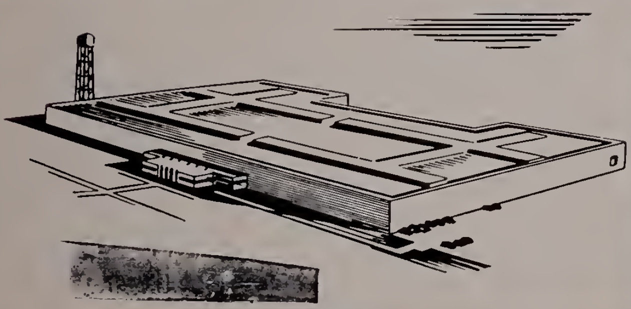
Getting the personnel needed for the jobs and carrying on the services for their individual benefit is also carried out. Some of the individual benefits may be operation of a cafeteria and a medical room, company insurance, a bonus or profit sharing plan, a safety program and deductions from their earnings as social security dues and the like.

Throughout the mill data is recorded daily. These records are kept by the different office personnel. They will be used for many purposes such as supplying the management and supervisors with information. Also, these records will be used within the department and inter-changed with others.

Since my job is teaching here in the Clemson Textile School, I will direct my answer to the young people of the industry and the student, past, present, and those of the future. They are handled by men that have acquired the experience and knowledge necessary to analyze. These men have developed their minds to think logically after many years of effective study. Now everyone recognizes the importance of study to train the mind to think profitably. The biggest problem of a teacher is to get the student not to just memorize facts, but use them as a basis for theoretical analysis. Maybe the student thinks the teacher is being dogmatic to give a question that requires some special thought. It requires time to develop the mind to analyze, therefore, one should consider this at an early age or in the case of a college student, at least upon entering the institution.

Several years ago, Mr. A. B. Sibley, Vice President of Judson Mills, one of the Deering-Milliken Mills, stated in the Clemson Textile School Student Magazine that there were more good jobs than good men. I believe the ability to think is one of the top requirements to qualify as a good man. Certainly one that can determine the best solution to the problem at hand, whether it be large or small.

NOTHING IS CONSTANT BUT CHANGE



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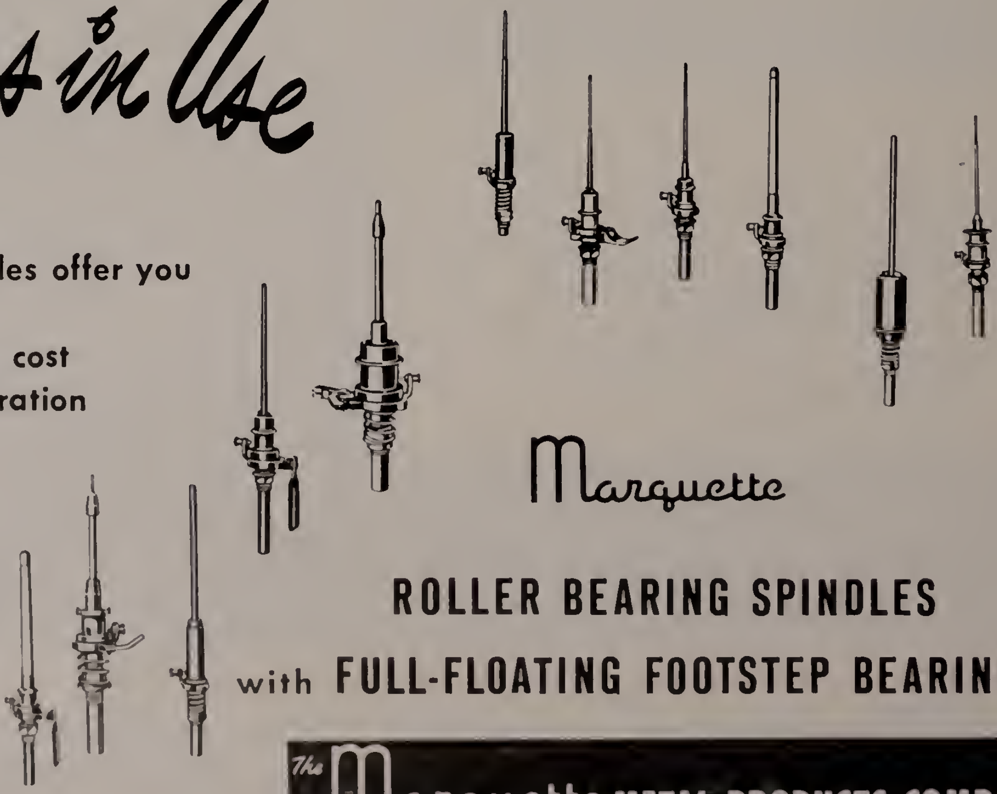

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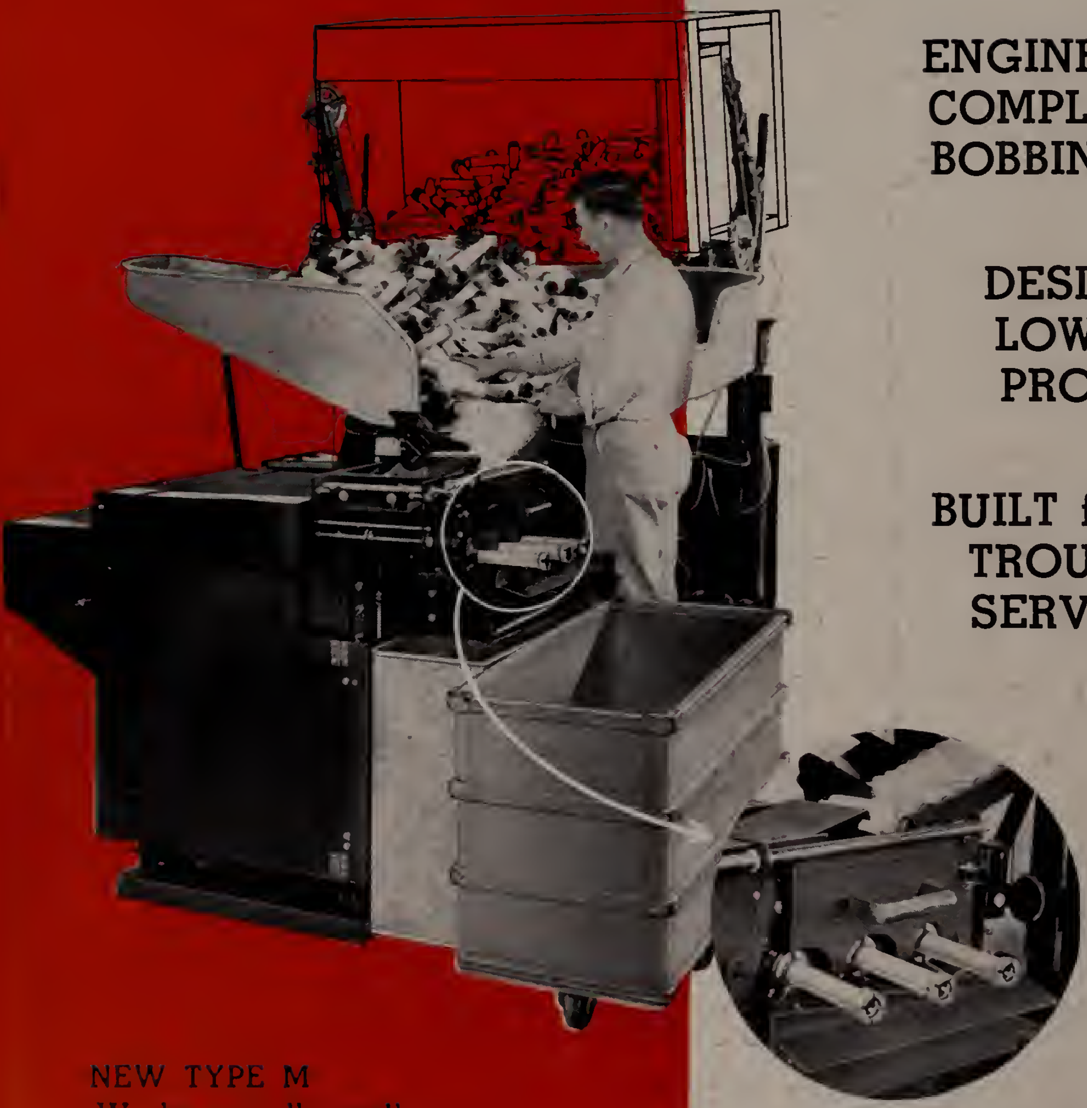

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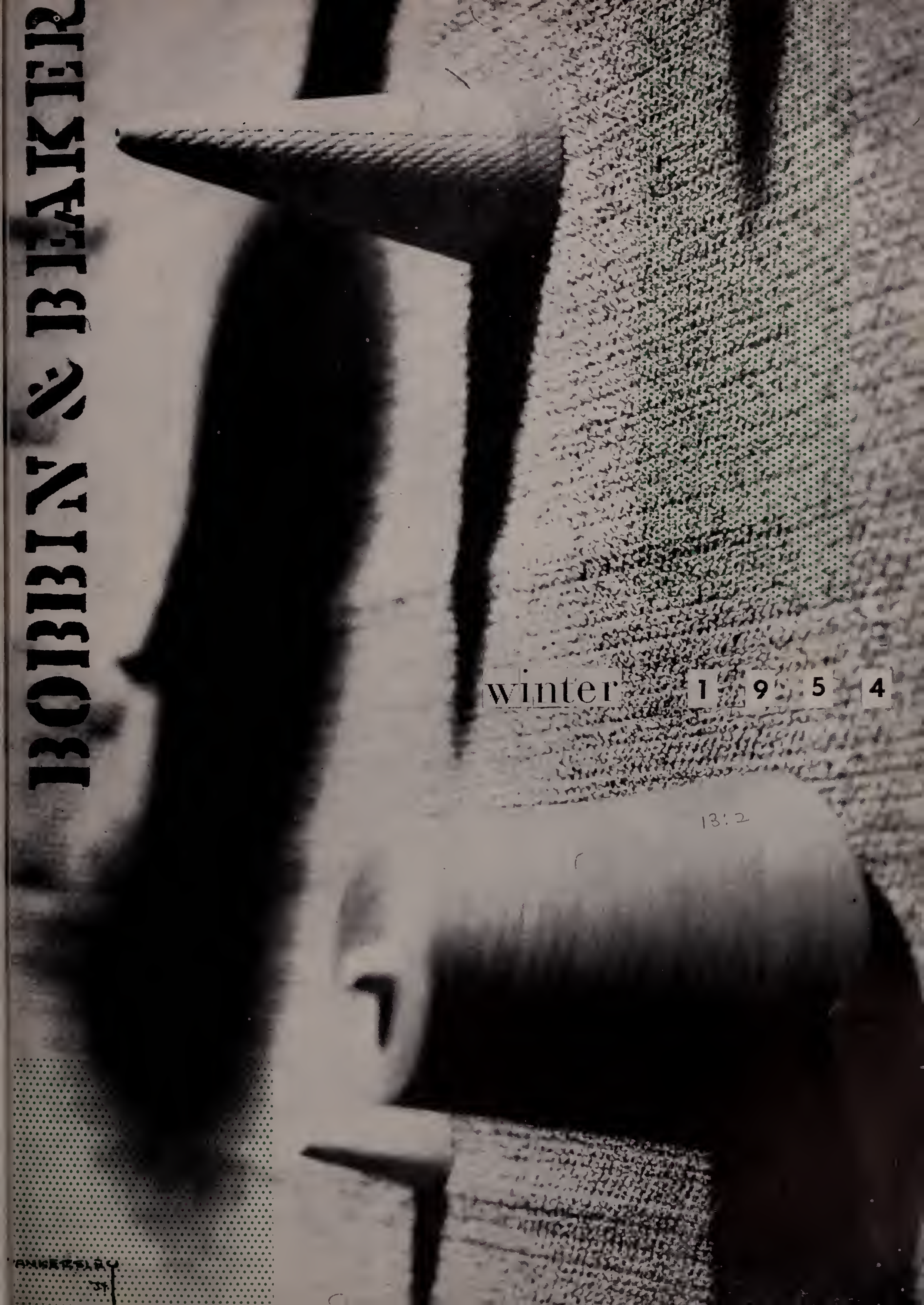

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THIRTY-NINE YEARS' NATIONWIDE EXPERIENCE
IN INDUSTRIAL AND TEXTILE DEVELOPMENT

THE

Bobbin & Beaker

Official Student Publication
Clemson Textile School

VOL. 13 **WINTER 1955** **NO. 2**

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THE COVER: You see on this cover a movement of forms playing shadows upon a "determined" field of texture. This in itself, objects and texture, suggests the content of the magazine—textile matter. The composition speaks of this in a way, not revealing the actual disposition of the matter inside, thus a phantom interest of what lies within, instills the individual to choose this magazine from a similar group when it perhaps might otherwise lie un-noticed.—Ladson D. Tankersley.

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THE BOBBIN AND BEAKER is a non-profit magazine organized to serve Clemson students and the textile industry. The publishing and circulation costs are financed solely through proceeds received for advertisements. We ask our readers to consider favorably our advertisers when buying.

Let's Visit The Textile School

By Marshall M. Clinkscales

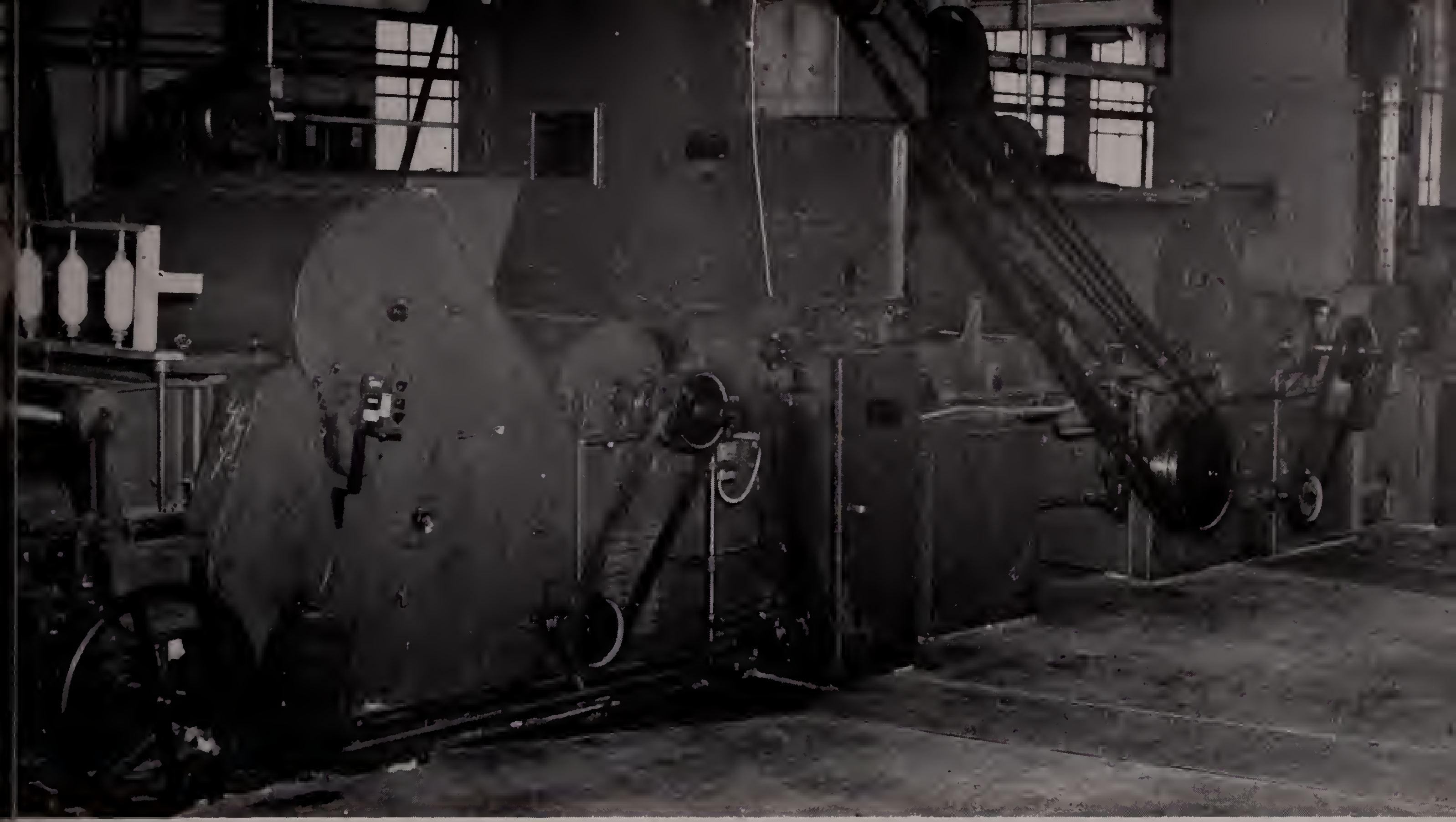
John Cothran and Bob Hughey, Photographers

This photographic essay is designed to illustrate the content and activity of the various laboratories to be found at Clemson's Textile School. It is hoped that in this way the reader who has never visited Clemson will become more familiar with the school and its instruments of training.

Some elements of the textile education progress at Clemson have been necessarily omitted from this story. They are the Jacquard Laboratory, the Junior Dobby Laboratory, the Sophomore Weaving Laboratory, and the Textile Library.

We wish to thank the Department Heads and Professors for rendering aid in the preparation of this article.—Editor.

Cotton Classing Laboratory—The cotton classing laboratory is located on the top floor, the West wing of the building. The long side of the room faces North, giving an excellent light with no reflections. It is used during school session for grading and stapling cotton in the cotton marketing class, and is used during the summer by a special four week cotton classing school. The laboratory is supplied with a set of Universal Standards for grading.



Opening, Cleaning, and Picking Laboratory—In the Opening, Cleaning, and Picking laboratory studies are made of the equipment used to open, blend, and clean the raw materials, and to prepare cotton and other staple fibers for succeeding yarn manufacturing processes. All equipment necessary to perform such duties is provided for in this laboratory. Some of the equipment is as follows:

2—Hopper type blending feeders
A Vertical opener
No. 11 Condensing section
No. 12 Lattice opener

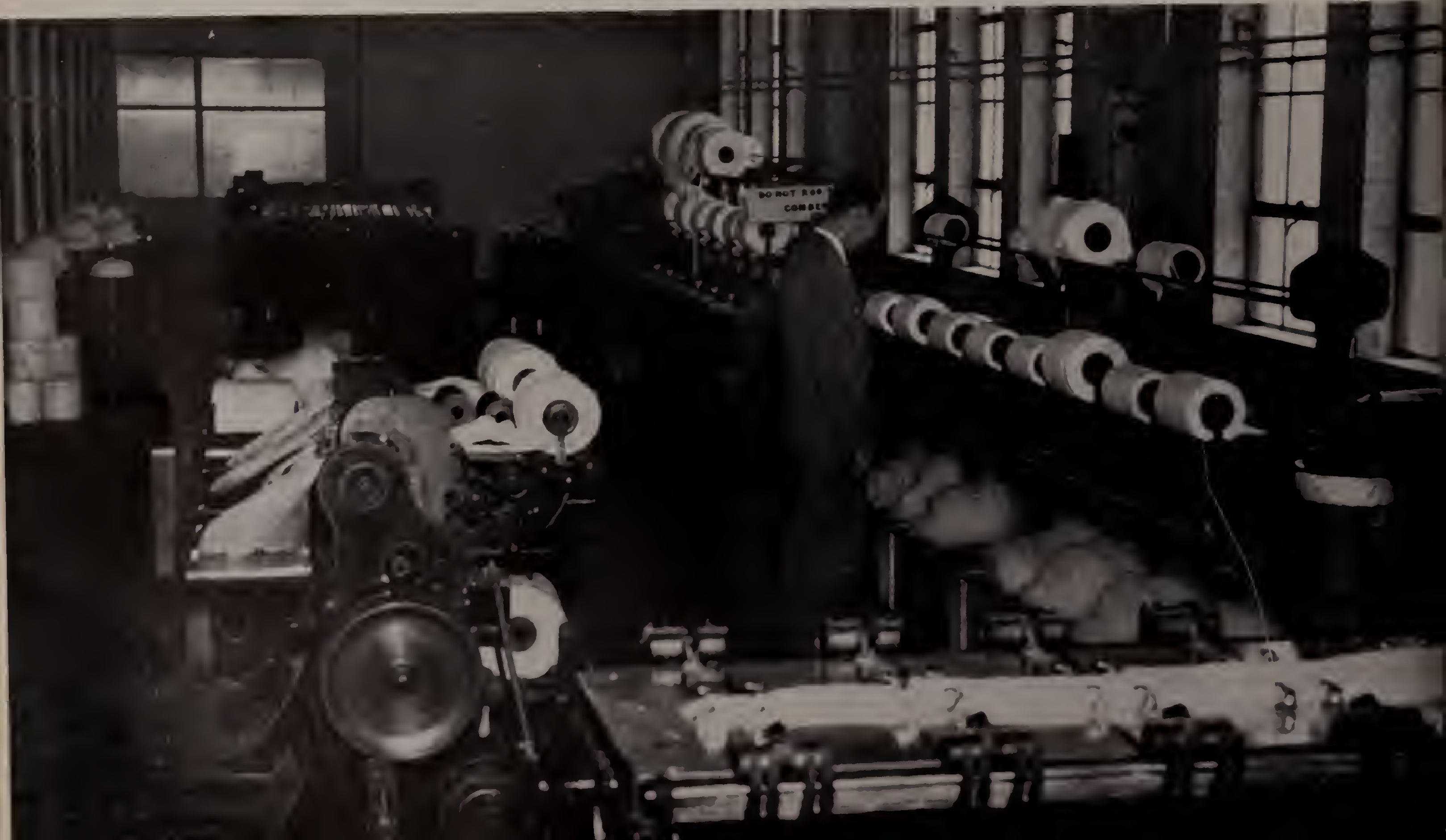
Carding Laboratory—The Carding laboratory consists of the following machinery:

One roller-top card, two revolving flat cards, three conventional drawing frames, one controlled draft drawing frame, and one lap winder.

The objective of this laboratory is to acquaint the student with the carding process, which enables him to learn the primary carding procedure.

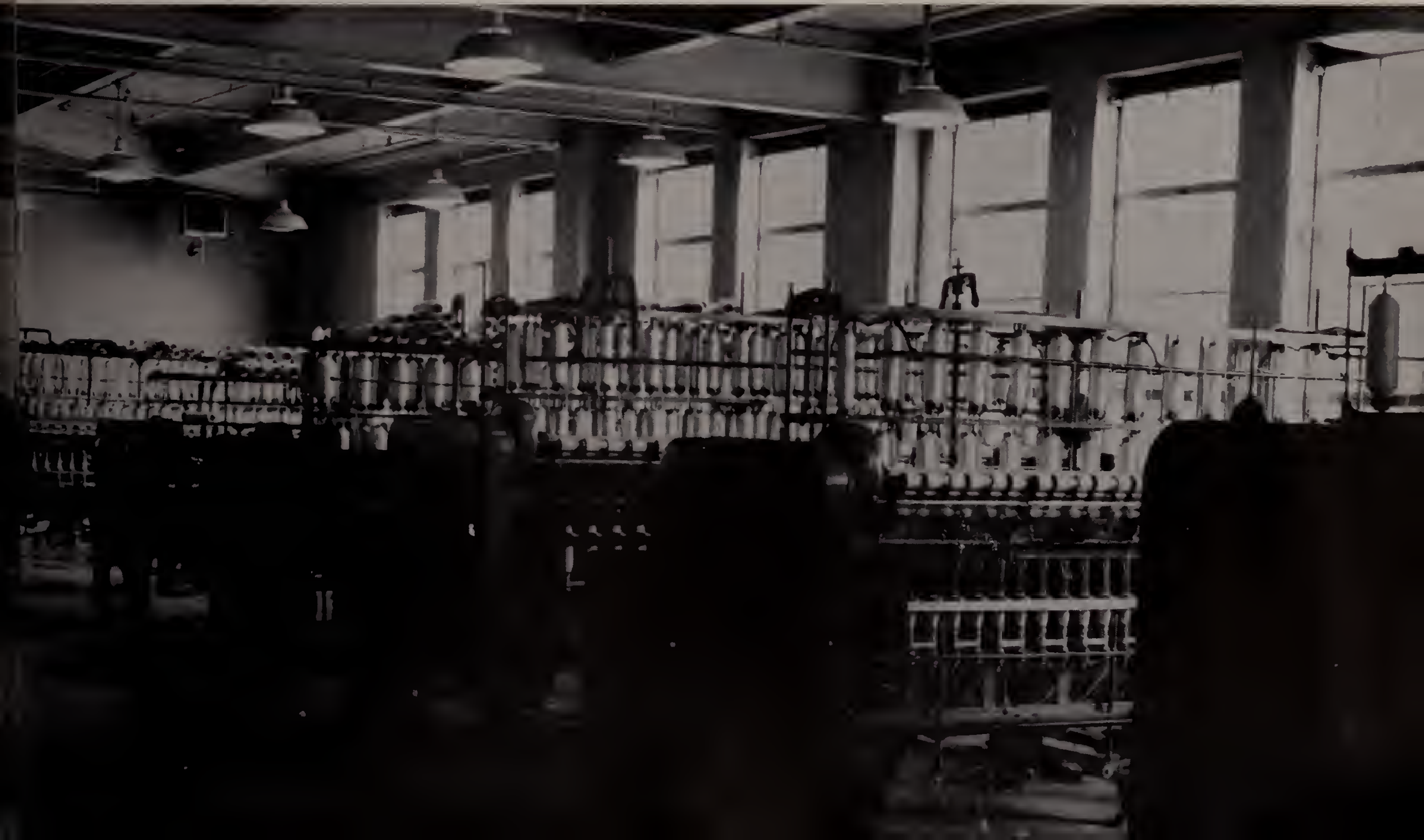
Roving Frame Laboratory—The roving frame laboratory is equipped with seven roving frames. Three of these frames are conventional frames and four are long draft. Two of the long draft frames have been converted from their original conventional style to their present long draft status, and the other two frames are new. With this set-up, practically any combination or range of drafts prevalent in modern roving processing can be accomplished.

Combing Laboratory—The combing laboratory has all the necessary equipment to instruct the student in the combing procedure. It has a long and a short piecing comber, two sliver lappers, one ribbon lapper, and one drawing frame. By observation the student learns to readily distinguish between combed and carded sliver. Primary mechanical motions of the comber are explained, while practical experience in operation of the various machines is the objective of this course.



Physical Testing Laboratory—The purpose of the Physical Testing laboratory is to give the student an understanding of the most important machines and techniques used in physical testing of fibers, yarns, and fabrics. Sample selection and a statistical analysis of experimental results, along with the applications of testing in modern textile research are stressed.

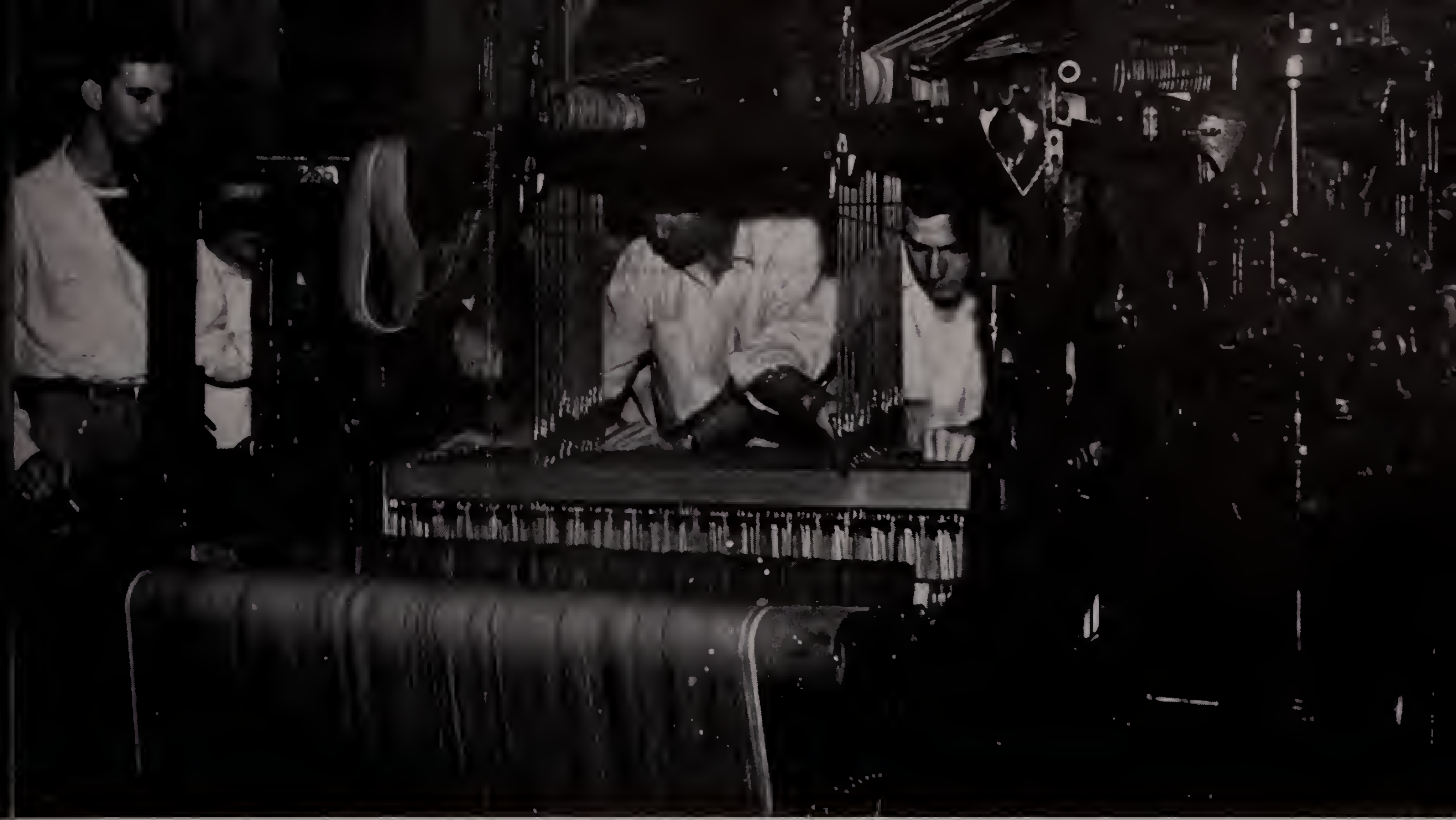
Spinning Laboratory—The spinning laboratory is used for practical instructions in spinning and twisting. It is equipped with thirteen spinning frames and five twisters. They are short frames, having from thirty-six to eighty spindles each, the short frames being excellent for instructive purposes. These frames include the various long draft systems. Sixty winding spindles complete the machinery layout.



Warp Preparation Laboratory—The warp preparation laboratory contains new warp preparation equipment which includes a spindle-drive rayon warp and a seven-can rayon slasher. Supplementary slashing equipment includes a fifty gallon stainless steel size kettle, and beam handling hoist and carrier system.

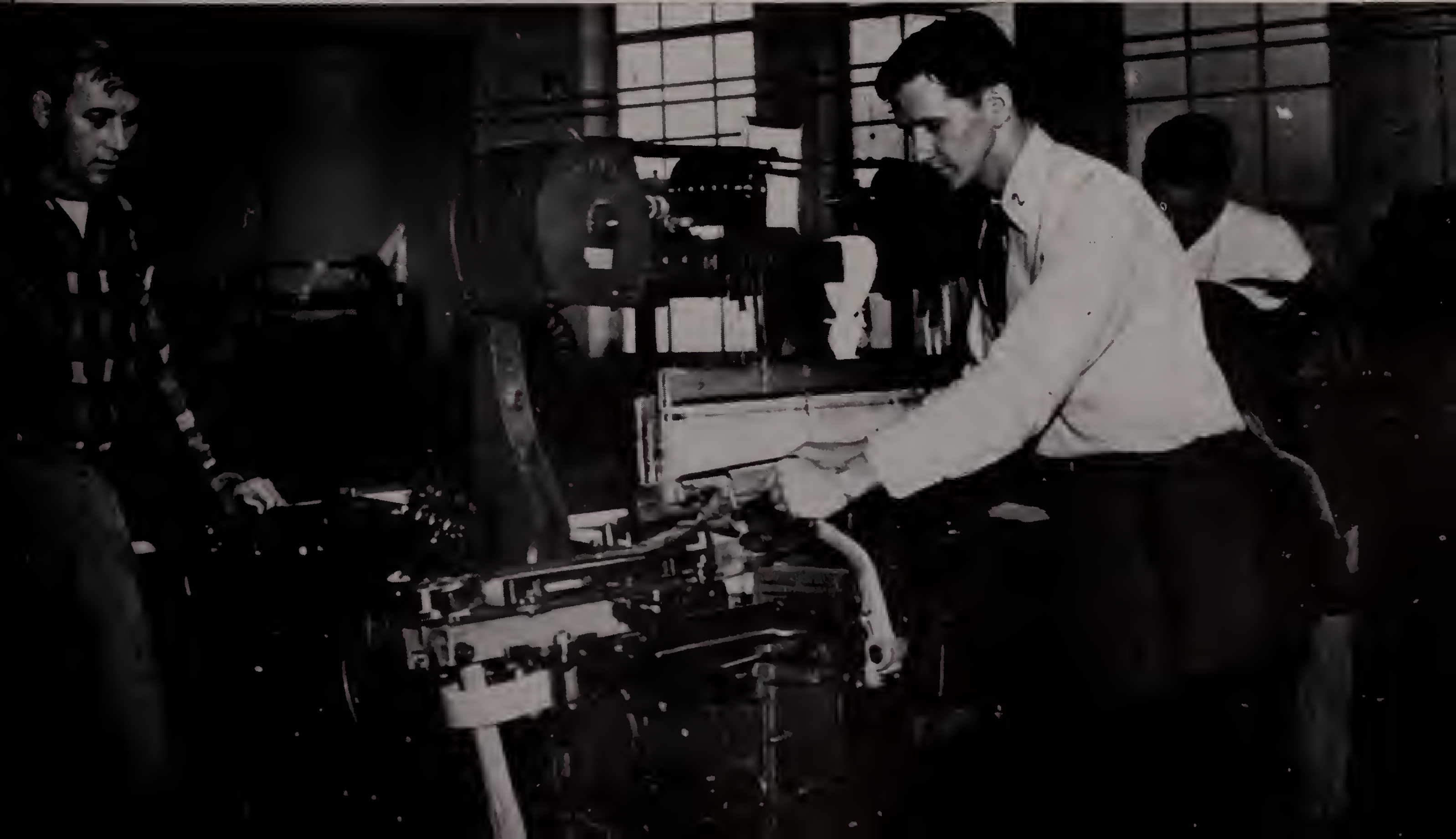
With this equipment it is possible to warp and slash all types of yarn including nylon, viscose and acetate rayon, spun rayon, cotton, wool and blends of these fibers.

Knitting Lab: The knitting lab is equipped with machines to give a B. S. degree in knitting. It teaches a thorough understanding of semi-automatic and automatic knitting machine located in mills today.



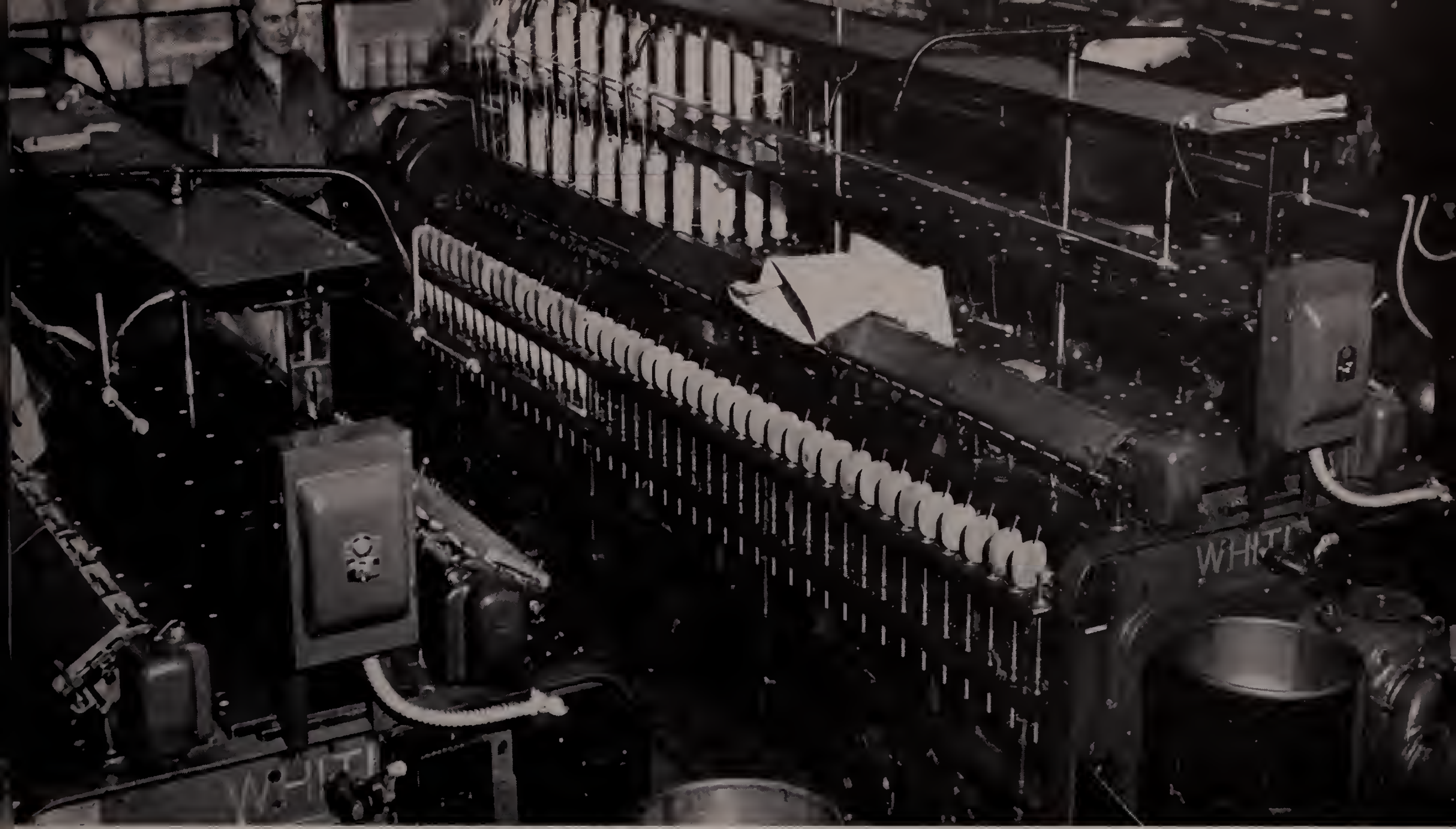
Dobby Laboratory (Senior)—The Senior Dobby Laboratory is used to teach Fabric Development to Senior students. Two students working as a team are required to design, make all calculations, and other data necessary for a fabric they have designed or for experimental fabrics submitted by the instructor. They are also required to tie on their own warps and make necessary adjustments on the looms so as to produce good quality cloth.

Cam Loom Laboratories—The Cam Loom laboratories contain twenty-one cam looms. Studies of the construction, mechanical operation, and adjustments of the cam loom are made. Also, analytical study of the loom, adjustment and timing of the shedding motion, picking motion, beating-up motion, gearings, speeds, and production.



Organic Chemistry Laboratory — The organic chemistry laboratory is located in the basement of the East wing of the building. The laboratory is equipped with the usual apparatus for carrying on experiments. Various experiments which are directly related to textiles are carried out.

Microscopy Laboratory—The Microscopy laboratory is designed to train the student in the use of the basic microscopic analysis of textile materials. This training includes not only the mechanics of manipulating the microscope but, more important, the study of all types of commercial textile fibers. These fiber types are examined for their individual characteristic which gives the student a means of recognizing different types of fibers, an understanding of the variety of features that can be studied by a microscope, and an ability to interpret and understand magnified images. The standard chemical laboratory compound microscope is used in all examination tests, it is also the basic instrument in conjunction with the necessary accessory equipment, used in micrometry, elementary cross-sectioning and polarized light analysis.



The U. S. Department of Agriculture, Production and Marketing Administration, operates a cotton fiber and spinning research office and laboratory on the first floor of the Clemson College Textile School Building. This laboratory is under the direction of Mr. J. M. Cook. Operations of this organization consist of fiber work, processing through weaving and finishing tests. Sources of the cotton run in this laboratory are various government cotton growing plots throughout the country, tests for government cotton ginning laboratories and various textile mills and cotton breeders who send in samples to be tested on a fee basis.

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Fiber Friction in Textile Processing

By
Dr. J. H. Langston
Prof. of Textile Chemistry
School of Textiles
Clemson College

Variations in the surface character of the different textile fibers have long been recognized as being responsible, at least in considerable part, for the differences in certain of the physical properties of these fibers and for their different behavior in textile processing operations. Obviously, the smooth surfaces of nylon, the striated surface of viscose, the convoluted character of cotton, the scaly surface of wool fibers, etc., have different frictional characteristics which are reflected in the properties of the fibers.

Although the exact nature of the frictional forces between fibers is not known, it is thought that the ordinary mechanical frictional inter-action may be complicated by such factors as electrostatic attraction due to charges generated between the fibers and by cohesive forces operating between fiber molecules. These factors are probably components of the force which is referred to hereafter simply as "cohesion."

Due to the correlation between the scaly surface (high potential friction) of wool and its important practical felting and shrinking properties, a great deal of work has been done toward clarification of the relationships involved. Measurements of the coefficients of friction have been made using many different methods and techniques but all depending in principle on determining the force required to make the fibers slip or slide past one another or past the other friction element involved. Of course it is necessary to define rather carefully the conditions of measurement in any given case, i.e., whether the friction is between fiber and fiber, or fiber and metal, fabric, or some other frictional material. The fiber direction is also important, the with-scales value being quite different from the against-scales friction. This condition holds true with all animal hair fibers.

In the case of cotton and other fibers where the hair length is too short for easy handling by the friction-measuring devices used on the longer hair fibers, other techniques must be used. As yet there is no perfectly satisfactory means of determining exact coefficient of friction of cotton fibers, although the methods in use do allow for comparative evaluations. Actually, there is great variation in frictional measurements on cotton (as on all fibers) depending on conditions of growths, the diameter (and, therefore, surface area) of the fiber, whether or not natural wax is removed before measuring, etc. Really adequate measurement of fiber friction must wait until every component of the total forces involved is recognized and the effects actually being measured are thereby clearly defined.

Measurement of the coefficient of friction of a fiber does not necessarily indicate the pattern of frictional behavior of these fibers during textile processing. This is due to the paradoxical requirements for fiber behavior during drafting and spinning. Up to the front roller the fibers should slip past one another readily (low dynamic friction) so that they may be paralleled easily. From this point on, however, fiber cohesion should be great (high static friction) to hold the drafted sliver together and, by high cohesion, to reduce the amount of twist necessary to give yarn strength. Some work has been done in the Clemson Textile School toward developing an instrument to measure the frictional force operating between fibers during the drafting process. From a practical point of view this is, of course, a most important aspect of fiber friction which is not always represented accurately by the conventional measurements of dynamic frictional coefficient on single fibers or on fiber bundles under artificial conditions simulating drafting.

The requirement of low friction at one stage of the process and high friction from the same fibers at another stage is further complicated by the fact that too great a difference in static and dynamic frictional coefficients would result in uneven drafting, giving thin places where the fibers have started to move and thick places where initial movement is slower. Obviously the requirements of maximum static friction values, minimum dynamic friction values, and the least possible diference between the two are impossible to achieve, and practical yarn manufacture is the result of finding a suitable compromise between these contradictory conditions.

The basic frictional relationships among fibers may be modified by the presence of lubricants, either those occurring in natural fibers or those added (as spinning aids, etc.) in natural or synthetic fiber processing. The fundamental functions of lubricant materials are no more clearly defined than the nature of fiber friction; but, stated simply, a satisfactory fiber lubricant should reduce friction while maintaining or increasing cohesion during the process of yarn manufacture.

The frictional characteristics of yarn after its manufacture should be such as to facilitate the weaving process. In sewing and knitting, low kinetic friction is desirable to allow high speed of movement without damage to yarn, needle, or fabric. Sufficiently high static friction is necessary, however, to prevent the yarn from dropping off the spools or cones. Many commercial lubricants are available to fit specific requirements.

Reducing fiber friction by lubrication is not the only means of varying this property. At times it is desirable for various reasons to increase friction by adding anti-lubricants. Yarns so treated have greater slip resistance in woven or knitted goods, and sometimes, a decreased luster, which may be desirable.

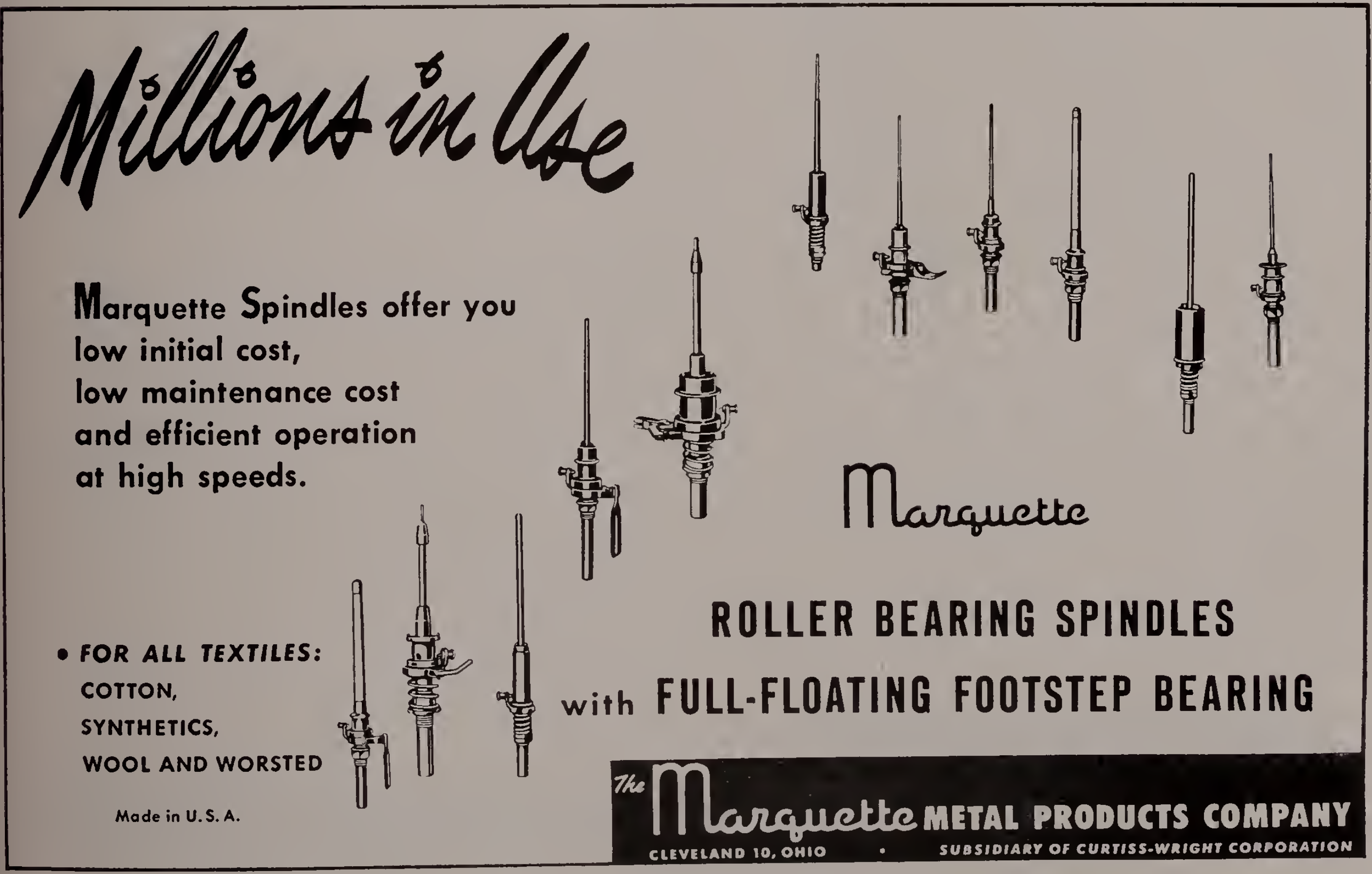
Many different agents have been used for this purpose, ranging from powdered glass or carboard to synthetic resins. The most important and interesting of these agents, however, is colloidal silica which has been used to a considerable extent in the spinning of woolen and worsted yarns. It is claimed that the use of this material results in increased efficiency in carding and spinning with improved tensile strength, greater uniformity, reduced fly, increased production by reduction in twist, and a reduction in the number of ends down during spinning. On this basis, a higher grade yarn can be spun from relatively low grade stock. Sometimes a mixture of silica and lubricant is used to produce a desired balance of properties.

There is evidence that the use of colloidal silica on cotton gives results similar to those produced on wool, although the conditions for optimum results have not been standardized. Some tests indicate that there is tremendous variation in the effect of silica on different varieties of cotton, and that the amount of silica added, the method of its application, and the size of silica particles are all important in determining the ultimate effect.

It is interesting to note that one mill has been producing quality yarns from silica-treated cotton for a number of years, using a purely empirical treating process. This is an important practical indication of the results that might be expected from the use of carefully determined optimum conditions for silica treatment.

The Clemson Textile School, under the sponsorship of the U. S. Department of Agriculture, has published a general survey of the literature on fiber friction and has investigated the application of colloidal silica and other agents to cottons under a

(Continued on page 15)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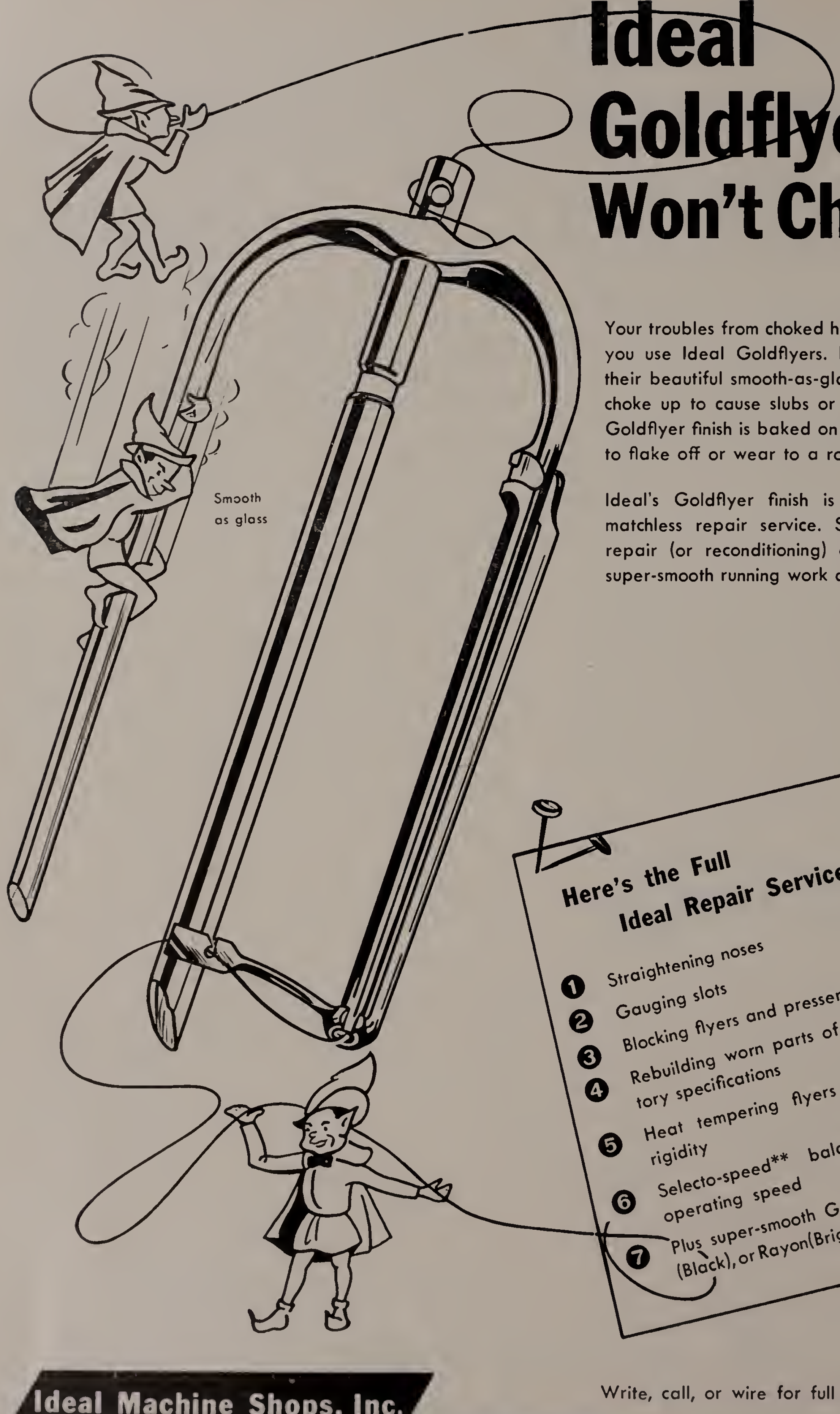

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Clemson Knitting Department Stresses Versatility

T. F. Ballentine

Mr. Ballentine finished Clemson in the class of 1954. He returned to school this fall to accept a position as Instructor of Knitting for a period of one year. He now teaches all knitting courses offered at Clemson.

In recent years, an art, as ancient as some of the old master paintings that hang in our museums, has come of age. Although the manually accomplished version of the art of knitting still flourishes, by far the majority of it is done by machinery. The art of knitting has indeed come a long way and it continues to grow daily. It is becoming an increasingly important factor in the field of wearing apparel for both men and women.

The greatest advance in the knitting industry was caused by the appearance of the now commonplace, "miracle fibers." Perhaps the first real "miracle fiber" was nylon which made its debut at the New York World's Fair just before the Second World War. Although rayon was conceded to be a better yarn than silk for hosiery manufacturing, nylon quickly replaced it as soon as it became available to the textile industry. Nylon now holds almost complete dominion over the other synthetic fibers in this phase of textiles. The synthetic trend grew steadily with the appearance of orlon, dacron and other yarns that were quickly adapted to knitting. Each has secured its niche in the textile industry.

Thus it is easily seen that the growing demands of the industry places proportionately increasing demands on our textile schools. The knitting department at Clemson attempts to cope with these demands by giving the students a complete education in all forms of knitting, designing and garment production. The curriculum calls for six knitting courses that cover all phases of knitting, from hosiery manufacture to bodywear knitting and garment manufacture. This adequately prepares the student for any type of employment he may seek in the industry.

Research is another by-word of the knitting department. In addition to several projects carried on by the textile school, it also helps the neighboring textile mills when and where it is possible. The most recent of these projects is the testing of Agilon, a nylon stretch-yarn produced by Deering-Milliken, which apparently will be a welcome addition to the field of hosiery manufacture. Other mills, both large and small, have called upon the department for advice in producing knitted goods.

The department is also noted for a sideline job of flag-making, notably the state flag. This part is carried on by Mr. J. C. Williams, a technician and part-time instructor. Among the first flags made by Mr. Williams were two requested by our Governor, the Honorable James F. Byrnes. Originally the school was required by law to make these flags at cost for public institutions. The law states that the flag be made of blue cloth with a white palmetto and crescent. The Palmetto is sewn onto the fabric with a stepping-needle machine which attaches the cutout firmly to the fabric. Anyone may order flags through the Dean of the School of Textiles.

Thus concludes a brief summary of the work done by the knitting department to improve the industry through the system of mill-school cooperation and most important, the well-rounded training of students.

FIBER FRICTION IN TEXTILE PROCESSING

(Continued from page 13)

variety of conditions in an attempt to correlate some of the factors mentioned above. A report of the findings of this investigation should soon be completed.

Although the frictional characteristics of fibers and yarn may contribute to the frictional properties of fabrics which they make up, their effect may be modified appreciably by the design of the fabric. For this reason, a treatment of fabric friction is not considered appropriate in this discussion. However, in certain aspects of fabric finishing as in raising nap, in fulling, etc., fiber and yarn friction are extremely important and cannot be ignored. In these cases the desired balance of frictional properties is obvious and may be varied by the use of the same types of friction-modifying agents as previously mentioned. Fabric friction is very important from the standpoint of wear resistance and may be measured by several methods.

From the foregoing discussion the importance of fiber friction to the textile industry is apparent. It will be of great interest to see what results will come from further investigation of the theoretical and practical aspects of the subject.

Where Are They Now?

Superintendent of Weaving

G. H. Hames '40, Borden Mills, Kingsport, Tenn.
H. R. Hoke '49, Brookford Mills Div., Brookford, N. C.
C. L. Langston '50, Slater Mfg. Co., Slater, S. C.
P. R. Rice, '50, Kingsley Mill, Thomson, Georgia.

Assistant Superintendent of Weaving

R. B. Fulmer '40, Springs Mills, Lancaster, S. C.
M. R. Goodman '47, Burlington Mills Corp., Shannon, Georgia
Emery Bates, Jr. '49, Augusta Weaving Division, Augusta, Ga.

General Overseer of Weaving

C. J. Glenn, '43, Abbeville Mills Corp., Abbeville, S. C.
J. C. Austell '47, Burlington Mills, Roanoke, Va.
W. E. McSwain '49, United Merchants & Mfgrs. Union, S. C.

Overseer of Weaving

W. D. Metts '34, Mills Mill No. 2, Woodruff, S. C.
M. J. Pinson, Jr. '36, Dan River Mills, Danville, Va.
W. R. Martin '47, Pacific Mills, Cayce, S. C.
Joel Phillips '48, Utica-Mohawk Mill, Clemson, S. C.
D. D. Rice, Jr. '48, U. S. Rubber Co., Winnsboro, S. C.
N. V. Smith '48, Springs Mills, Lancaster, S. C.
R. A. Bolick '49, Muscogee Mfg. Co., Columbus, Ga.
G. W. Griggs '49, Cannon Mills Co., Kannapolis, N. C.
J. R. Johnson '49, Startex Mill, Startex, S. C.
A. E. Saylors '49, Matthews Mill, Greenwood, S. C.
R. W. Sistrunk, Jr., '49, Whittier Mills Co., Atlanta, Georgia
J. R. Snipes '49, Gluck Mill, Anderson, S. C.
L. S. Smith '49, Kingsley Mill, Thomson, Ga.
S. E. Ball '50, Appleton Mill, Anderson, S. C.
J. R. Pruitt '50, Woodside Mills, Greenville, S. C.
H. L. Gambrell '51, Galey Mills Corp, Pickens, S. C.

Assistant Overseer of Weaving

H. S. Ackis '41, Johnston Mills, Johnston, S. C.
Wm. Leonhirth '41, Springs Mills, Lancaster, S. C.
H. R. Kinnedy '49, J. P. Stevens, Clemson, S. C.
J. O. Cleveland '50, Orr Mills, Anderson, S. C.
Q. H. Gellers '50, Kendall Cot. Mills, Prosperity, S. C.
J. W. McMahan '50, Burlington Mills, Galax, Va.
C. L. Pace '50, Ossipee Weaving, Elon College, N. C.
J. B. McIntyre '51, Mayfair Mills, Arcadia, S. C.
J. L. Langley, Jr. '52, Consolidated Textile Corp., Lynchburg, Va.
K. F. Sanders '52, Burlington Mills, High Point, N. C.
J. R. Shirley, Jr. '52, Burlington Mills, Burlington, N. C.

Second Hand of Weaving

M. C. Elrod '49, Kingsley Mill, Thomson, Georgia
G. E. Uldrick '49, Woven Plastics, Abbeville, S. C.
R. A. Gettys, Jr. '50, Dan River Mills, Danville, Va.
J. D. Hopper '50, Slater Mfg. Co., Slater, S. C.
D. W. McCoy '50, Roanoke Weaving, Roanoke, Va.
C. W. Patterson '50, Laurens Mills, Clinton, S. C.
G. C. Ridenhour '50, Judson Mills, Greenville, S. C.
H. S. West '50, Union-Buffalo Mills, Buffalo, S. C.
B. R. Black '51, Monarch Mills, Union, S. C.
D. H. Campbell '51, Dan River Mills, Danville, Va.
G. R. Isenhour, Jr. '51, Burlington Mills, Franklington, N. C.
A. H. Clarke '52, Slater Mfg. Co., Slater, S. C.
J. V. Roberts '52, Deering-Milliken, Rutherfordton, N. C.
L. J. Sigmon '52, Burlington Mills, Fayetteville, N. C.
R. I. Howard '53, Greenwood Mills, Greenwood, S. C.

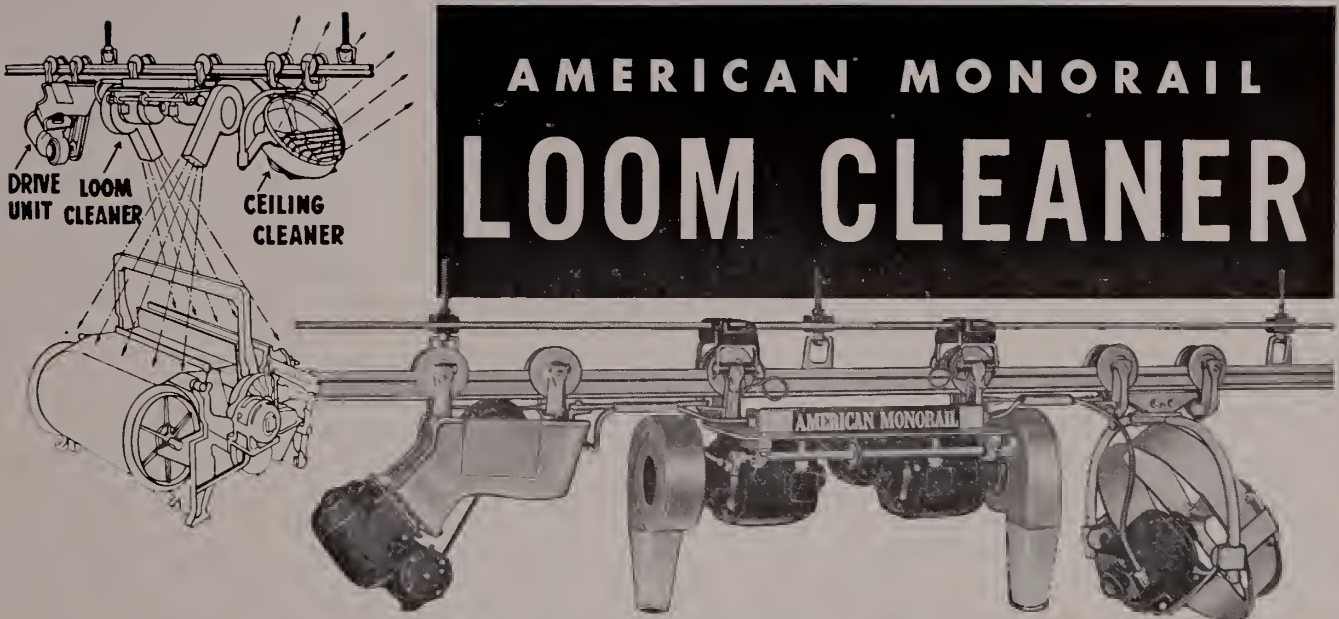
AMERICAN SOCIETY FOR QUALITY CONTROL

The fifth annual conference of the Textile Division, American Society of Quality Control will be held January 27, 28 and 29 at the Clemson House, Clemson, S. C. Approximately two hundred people are expected to be in attendance, including textile men from England, Canada, Mexico, and from all over the United States.

On January 27, there wil be tours around the various departments of the textile building. On January 28 and 29, several speakers will discuss the various stages of Quality Control.

Details and registration blanks may be obtained by writing Dr. R. G. Carson, Jr., who is General Chairman of the Conference, Textile Building, Clemson, South Carolina.

AMERICAN MONORAIL
LOOM CLEANER



prevents lint accumulation on looms and weave room ceilings

The first experimental loom cleaner was placed in operation by American MonoRail in 1948. A similar model was shown at the Southern Textile Exposition, Greenville, S. C., in 1949 and earlier that year was the subject of editorial mention in the textile magazines.

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WILLIAM F. HARPER — Frampton Harper, a textile manufacturing major from York, S. C., is well-known throughout the college as well as in the School of Textiles. Being the Cadet Chaplain, Framp is known as the "parson" to most of the troops. A recent honor was to be listed in the 1954-55 edition of **Who's Who in American Colleges and Universities.** He belongs to Phi Psi, a textile honorary fraternity. Other clubs and fraternities of which he is a member are Senior Platoon, Scabbard and Blade, Tiger Brotherhood, and Canterbury Club. He is vice president of Blue Key. Framp's hobbies are reading, hunting, and fishing. After his tour of Air Force duty, he hopes to join a training program in a mill and then decide which type of textile work he will follow. Framp has worked at Rock Hill Printing and Finishing Company and at Sullivan Southern Mill in York, S. C.

WILLIAM A. KEY — Fishing, hunting, and collecting records of modern jazz are the hobbies of Bill Key, textile manufacturing major from Columbia, S. C. He belongs to N.T.M.S. and Phi Psi, a textile honorary fraternity. He is also a member of the Senior Platoon, Student Assembly, and Blue Key. He will be listed in the 1954-55 edition of **Who's Who in American Colleges and Universities.** Bill has been employed by Pacific Mills in Columbia for three summers, working mostly in the weave room. He would like to enter the textile business in production and settle down in sales. As a result of his experience in a mill, Bill has noticed the difference between the way subjects are taught and the way they are applied in the mill.

WILLIAM O. STONE, JR. — Bill Stone, twenty-two year old senior majoring in textile chemistry, is one of the outstanding students in the Textile Department. He was also a member of the Pershing Rifles, Freshman Platoon, and Track Team, specializing in the one-quarter and one-half mile cross country run. Bill will finish in June and plans to enter the dyeing end of the textile business. He will get a Signal Corps commission and will enter the service in January of 1956. Bill finished Newberry High School and hails from Newberry, S. C.

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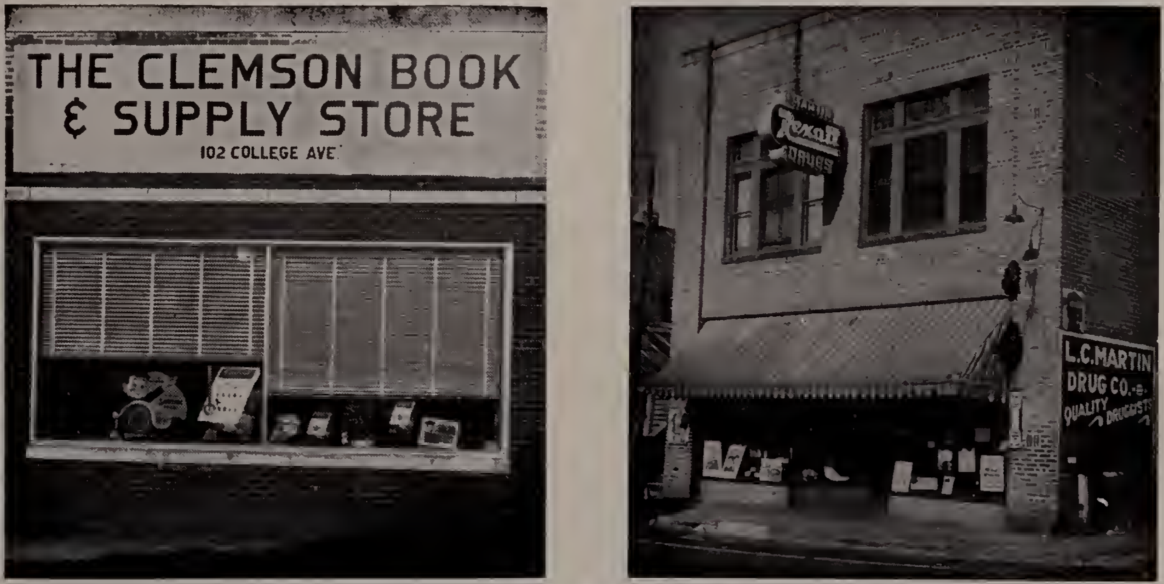

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THE EIGHTEENTH ANNUAL SOUTHERN TEXTILE EXPOSITION

By Emil Stahl

The week of October 4-8 marked the eighteenth showing of the Southern Textile Exposition in Greenville, S. C. Since its opening in 1915, the exposition has grown larger and larger with each successive year. Over 300 exhibitions of textile machinery, equipment, and supplies were shown this year in Greenville's Textile Hall. Besides the many domestic exhibitions, several foreign countries were also represented — West Germany, Switzerland, and England being included.

The following comments were expressed by a few seniors majoring in textiles after being questioned on what they enjoyed most about the exposition; the outstanding feature that they noticed; and what improvement they would like to see at next year's show.

The majority of those questioned on what they enjoyed in particular answered that they liked talking to the respective company representatives about their product and the various problems that arise in the textile industry. The many Clemson Alumni present gave the show a special added color.

In general, it was thought that the foreign displays were by far the most outstanding new feature. The high speed Ruti loom received the most comment. The German quiller also received favorable comment.

The exposition left a very favorable impression on all, though some thought that in comparison to the amount of new features, there was too much repetition of exhibits that have been shown in previous years.

In regards to possible improvements for future years, many students thought that if one type of textile machinery could be located in one particular section that much confusion would be eliminated. Also that if the hours of the exposition could be lengthened, many more people could come to view the many sights. In place of the many advertising displays, in general it was thought that more space could be devoted to showing of the machinery which is more directly concerned with the business.

Several students commented that the exposition would have been more interesting had there been a few guides to show small groups around. This would eliminate the possibility of over-looking items of importance that might be located in out-of-the-way corners.

I was particularly surprised to find the absence of knitting machinery. In view of the very prominent position which the knitting phase of the industry plays, I believe it would be of the utmost interest to personnel in the field, to have machinery of this type represented at the exposition next year.

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Office Notes

By Charles H. Ferguson, Editor

This year, THE BOBBIN & BEAKER is trying to bring you a magazine which will be more interesting to the students at Clemson as well as our other readers. We are adding color by presenting more student personalities, increasing interest by having leaders in the textile field write guest editorials and striving for a better magazine by asking you—the reader— for advice. We can only do this with your cooperation and your willingness to help.

For fourteen years, THE BOBBIN & BEAKER has been a principal link between the School of Textiles and the textile industry. Most of its success belongs to THE BOBBIN & BEAKER staffs of this and past years, plus the gracious assistance given to us by our faculty advisor, but a large part of this success comes from advice written to us from our readers. We encourage you to help us make a better BOBBIN & BEAKER.

Highlights of our next issue will be two guest editorials: One from Mr. W. J. Erwin, President and Treasurer of Dan River Mills; and one from Mr. E. H. Hines, Jr., General Manager of the McCormick Group, Deering-Milliken Corporation. Also Professor Roscoe J. Breazeale will present an article entitled, "The Challenge" which should prove very interesting.

THE BOBBIN & BEAKER expresses sincere appreciation to Professor A. E. McKenna, who has been our adviser for the past six years. Professor McKenna is head of the Weaving and Designing Department and teaches warp preparation.

Remember, we need your help and look forward to hearing from you.

OUTSTANDING SENIORS (continued)

JOSEPH F. MATTISON — Joe Mattison, a textile chemistry major from Belton, S. C., is one of the few high honor students in the entire college. He is vice-president of Phi Psi and AATCC, textile fraternities, and is co-editor of the Blue Key directory. He will also be listed in this year's edition of Who's Who in American Colleges and Universities. Joe, a Distinguished Military Student, plans to receive his commission in the Quartermaster Corps. He attended summer camp at Fort Lee, Va. He is assistant S-3 on the Cadet Regimental Staff. His summers have been spent working for his father in Mattison's Hardware in Belton, S. C.

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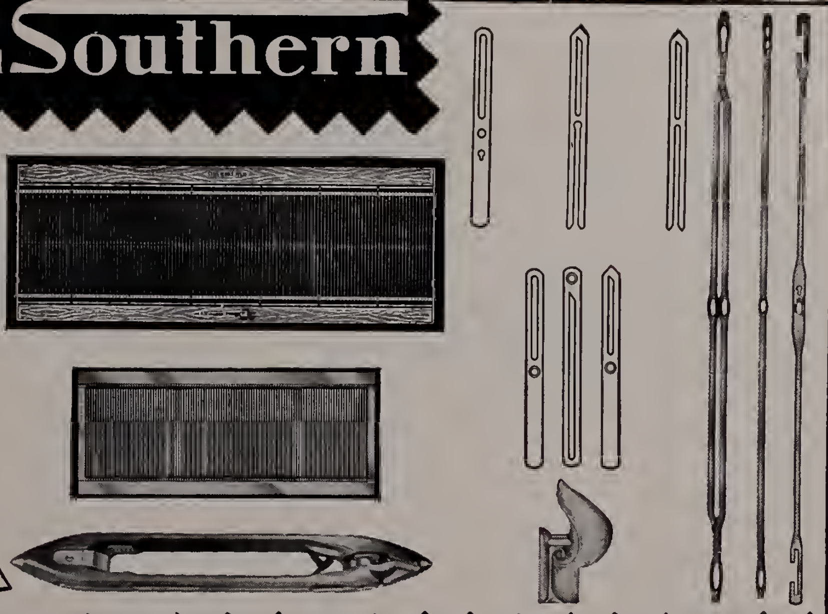

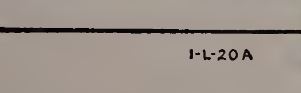

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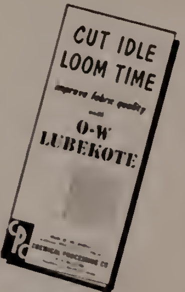

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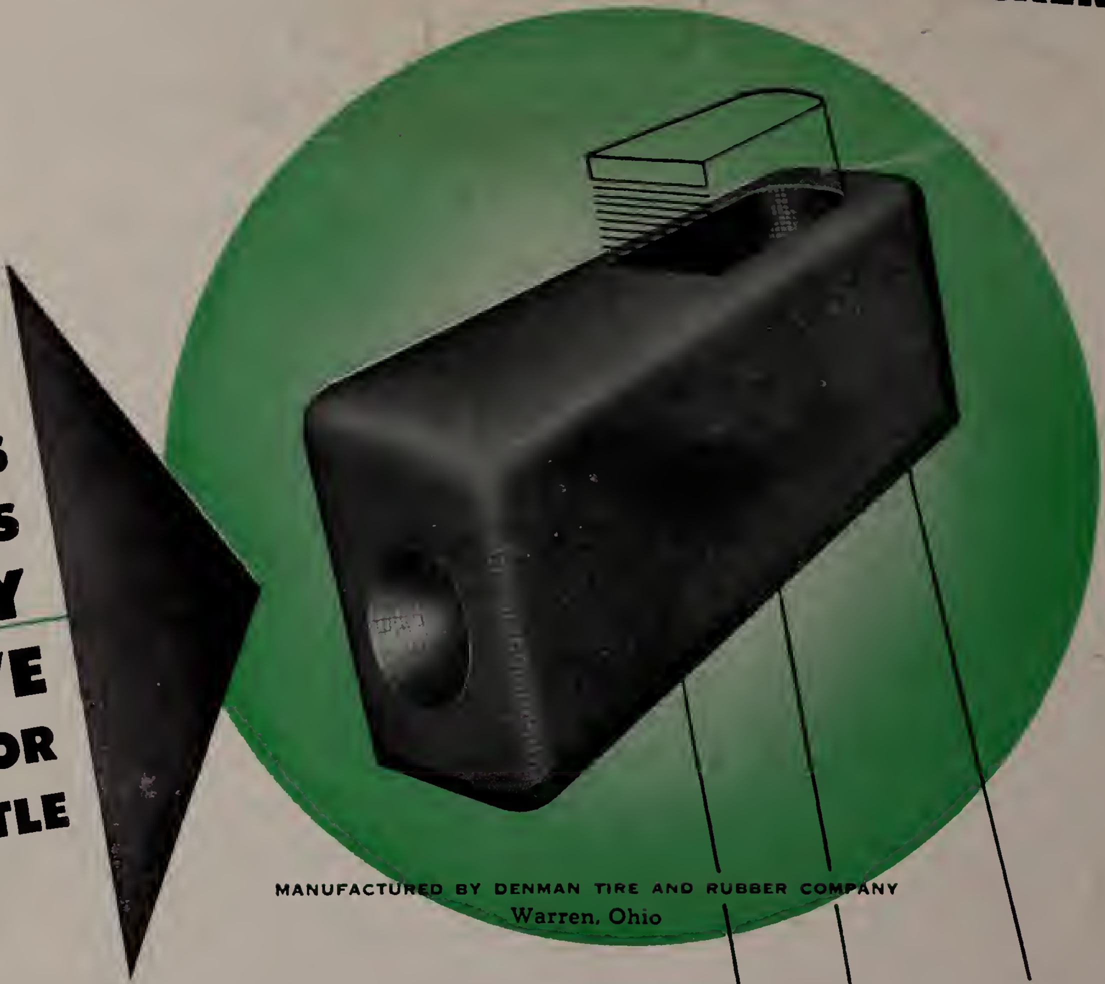

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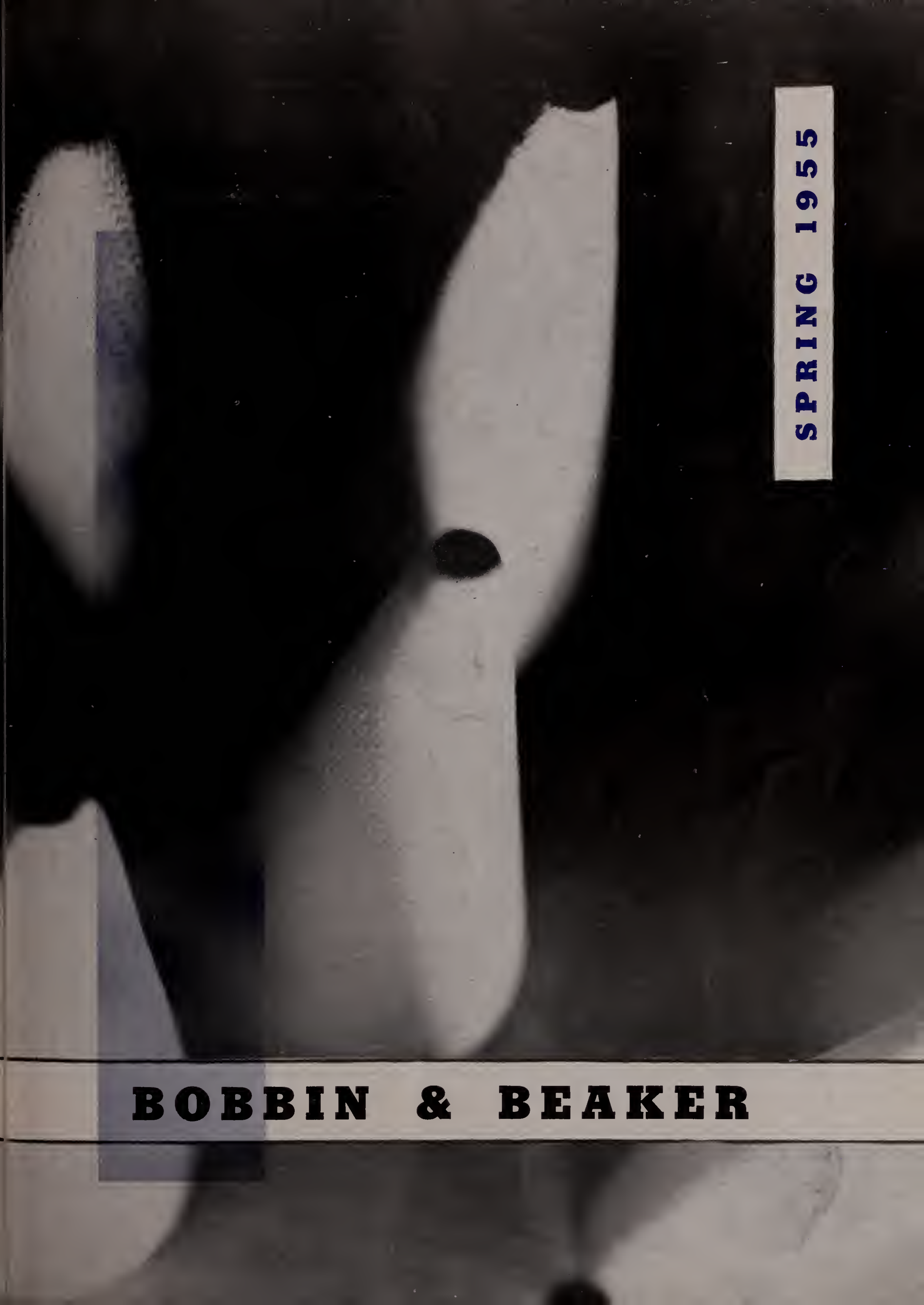

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Official Student Publication
Clemson Textile School

VOL. 13 SPRING 1955 NO. 3

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In This Issue

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Outstanding Seniors in the School of Textiles 15

THE COVER: This backing is quite similar to the last issue . . . a study with light and textile forms . . . an interesting arrangement can do quite a bit for a cover and I hope they have been effective, for this is the last by me via graduation.

THE BOBBIN & BEAKER. Organized in November, 1939, by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge four times during the school year by students of the Clemson College School of Textiles. All rights Reserved.

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Stretch Yarn Developments In The School of Textiles

DR. HUGH M. BROWN
Dean, School of Textiles

This is a preliminary progress report on some methods by which so called "stretch" yarns have been made at Clemson.

After development of more of these methods it was found that they had already been proposed or patented, so it is not known but that more of them have been tried, and some may be in commercial use. The work has been going on intermittently over the past two years, having been started when men's stretch hose first appeared on the market.

The methods of manufacture of the stretch yarns mentioned at that time included both twisting and crimping processes, and the **"Twist-Untwist"** type seemed to dominate the picture. In this process, as most often described, two nylon (or other thermoplastic) yarns are plied with high twist, steam set at suitably high temperatures, and then untwisted. Finally one strand with S twist and one with Z twist are plied with a low twist. This twist gives a yarn, which, if never heated to a high temperature tends to forever contract to a fairly small fraction of its original length. Furthermore, the individual filaments tend to act more or less independently, and in the relaxed state form small coils and loops which give the fabric a texture and lack of shininess that is normally characteristic of fabrics made of the normal nylon filament yarn.

The reason for pairing a strand having S twist with one of opposite twist, is that either strand alone acts as a very highly twisted yarn that has not been set, and if conditioned to kill the "liveliness", it loses much of its elastic effect.

It is seen that the process is expensive since much time is required to insert the high twist and also to remove it. It is an intermittent process consisting of several steps.

At about the same time a stretch yarn was being made by a non-twisting, crimping method in which a fabric is knitted, given a steam treatment, then ravelled to produce yarn, which is then knitted into the final form. The elastic effect is produced by the first knitting tending to stay in the yarn, and thereby distorting the course formation when knitted into the final fabric. The process gives much elastic effect and a crepe-like fabric instead of one with smooth, shiny surface.

The process is intermittent and somewhat costly due to the repetition of knitting. Sometimes in knitting, trouble arises from the old loops getting in and out of phase with the new ones, causing patterning.

At this point, the first work of studying the problem of making stretch yarns by continuous, single process methods, was begun at Clemson.

Wrapping on Fine Rotating Wire—One of the first methods tried was the wrapping of nylon yarn closely on a section of rotating, advancing, cord or wire.

The yarn under suitable tension is fed on to the wire at the top of the wrapped section and unwound from the bottom end, and thence, passed on to a wind-up device. The wire advances at the correct rate to keep the yarn entering and leaving at constant positions. Around the top part of the wrapped section the yarn is heated above its thermoplastic setting temperature. After passing through the heater the yarn is cooled below the setting temperature before it reaches the unwrapping position.

The cord or wire on which the nylon yarn is wrapped may be a section in one side of a continuous loop, or a section of cord or wire advancing from a package above to one below, both of which turn with the rotating cord or wire. Thus, stretch yarn may be made continuously. Of course, two strands spiraled in opposite direction must be used together to make a balanced yarn that will knit well and not cause the finished hosiery to wind or twist.

The yarn made by this method acts as if it had been twisted, though no net twist has been inserted. The smaller the cord or wire on which the coil is wrapped, the higher the elastic effect. The rate of production of the system depends on the fineness of the wire, and on its speed of rotation, but could probably be made to exceed the rate of the "**Twist-Untwist**" method.

False Twisting Methods—A false twisting method was tried wherein two strands of nylon yarn, after passing through a thread guide, are twisted together for a short distance by means of a special rotating trumpet through which the yarn passes. The section between the trumpet and the guide is given a very high twist. The yarn is heated in the first part of the twisted section to set the twist and then cooled in the remaining part of the twisted section before passing through the trumpet. The twist (as in all false twisting devices) comes out of the strands as they pass through the trumpet and the two strands can be separated and wound up on different spools. Yarn made in this manner has the same characteristics as that made by the twist-untwist method and, strands with S and Z spiral are paired to make the final yarn. This is a single process method and since the trumpet can be easily driven at very high speeds, it seems a rather high production rate may be possible. There are some disadvantages, however, which may be the reason the method is not in more general use. With multifilament yarn, a broken filament may go with the wrong strand at the point where the untwisting occurs and cause a stoppage. Though this difficulty does not occur with mono-filament yarns, it seems that the twist has to be exceedingly high for such small strands, and that they will sometime break rather than untwist at the point of separation. It seems that both of these difficulties can be somewhat reduced by simultaneously twisting many strands instead of only two. Of course, this gives less stretch effect for a given intensity of twist. Using many strands seems to improve the operation on the fine mono-filament yarns more than it does on heavier multi-filament strands.

In a method using a **Hot-Cold Wire**, a short piece of wire passes from a heated metal block to a cool metal block and the yarn is given several turns around this wire, entering on the hot end and leaving on the cold end. When the yarn is pulled, it simply slides around the wire, being set into small spirals while passing around the hot section and being cooled before leaving the cold section. If the wire is made fine, a very good stretch yarn is formed, especially with mono-filaments. Multi-filament yarns give some difficulty by individual broken filaments staying wrapped around the wire and "skinning back" as the strand moves on, thus causing stoppages. It is believed a previously inserted low twist may eliminate this trouble with multi-filament yarns. As in the twist-untwist method, to make a completely balanced yarn, two strands with opposite spiral must be used together.

After the above studies had been made it was found that quite a number of false twisting methods of producing stretch yarn had already been patented as well as the crimping of yarns by passage through heated gears. An obstacle to attaining high production from heated gears is the removal of the hot yarn from the gears causing the crimp to be easily pulled out with only slight tension. A method of avoiding this limitation was developed and is described below.

A **Pre-heating Method** in producing stretch yarns was used in a number of devices in which the yarn is drawn through a pre-heating chamber and immerges through a hot nozzle. With this arrangement the pre-heated yarn may be drawn around a **cold** wire which is kept cold by contact with two cooled metal blocks. By using 1 or 2 turns around the cold wire, the yarn is set in the desired small coils even when drawn over the wire at quite high speeds. There is no longer any problem of de-crimping while pulling the yarn away from the deforming device since it is already cooled before being withdrawn. The maximum rate at which the yarn may be drawn over the wire depends on how fast the wire can carry away the heat it receives from the yarn. The shorter the wire between the blocks and the colder these blocks, the faster the yarn may be pulled over the wire. To keep the wire from wearing out too rapidly, it is arranged to advance slowly through the blocks so that it is not always worn in the same place.

By the use of **Sharp Edges**, it was found that considerable spiral effect in yarn could be produced by pulling pre-heated yarn from the heated nozzle over a fairly sharp corner, or edge of a **cold** bar. Drawing the yarn slightly diagonally across a cold edge gives it a coiled effect as if it had been drawn around a wire. The direction of such coiling can be reversed by reversing the angle at which the yarn is drawn over the cold edge. Due to this coiling effect, the yarn produced is very lively and acts as if it had a twist effect, snarling when slackened. Of course, this effect can be cancelled by using two strands having opposite spiral.

Oscillating Forming Edge:—Another way liveliness in stretch yarn can be eliminated is to oscillate the edge over which the yarn is being drawn so that at very short distances along the yarn, the coiling direction is alternated back and forth so that in any appreciable length of the yarn there is no net twist effect.

Crimping with Cold Gears:—The pre-heating principle works very well for crimping with **cold** gears. The nozzle of the yarn heater is mounted very close to the gears so that the heated yarn can be drawn into the gears at such rate that it is not cooled until it has been formed between the meshing gear teeth. Here again, the colder the gears, higher the rate at which yarn can be drawn through with permanent crimping. There is no problem of decrimping the yarn by tension on the output side since the deformations have already been set before leaving the gears.

The elastic effect of the crimped yarns does not seem to be as great as it is for yarn having the spiral or twist deformation, but it does have the disadvantage of running very nicely in the knitting machines, and has no tendency to stretch and to snarl when not under tension. It is believed that the size of the crimps produced by the gears should be much shorter than the loops formed in the knitted garment. Fabrics from such yarn have a delustered appearance that is much smoother than fabrics made from yarn produced by the knit-ravel-knit method. The crimped yarn has an outstanding advantage in that there is no necessity for pairing two strands. In ladies' hose it seems to produce ample elastic effect and has a more pleasing appearance than the extremely creped yarn.

Yarn Its Own Knife-Edge:—By passing pre-heated yarn under a small rod and back over the top and one-half turn around the incoming yarn, a very tight spiral effect can be produced by simply pulling the yarn around the rod and around itself. The size of the spiral can be somewhat controlled by the tension of the incoming and outgoing yarn. The method seems to work excellently on mono-filament but not so well on multi-filament which, due to its greater size, cannot be bent around itsself as sharply as the single filament.

Hot Rotating Blade:—It has also been found possible to produce stretch yarn by winding yarn from the pre-heater over a hot rotating blade or small triangle. The yarn is given one turn around the blade and carried on to the wind-up mechanism. A small blade or triangle (less than 1/32 inches wide) can be run at high speeds though probably the limiting speed is again determined by how fast the blade may heat yarn. By making the blade very short and mounting it in an arbor having high heat conductivity (such as copper or aluminum), the heating rate can be made quite high and in all probability could be augumented even further by pre-heating the yarn. Although the yarn from this device has some twist effect, it is not so pronounced and could be removed by a second twisting operation which would leave the sharp crimp for elastic effect.

A summary of patents shows that several other methods of making crimped yarn have been proposed. Two general principles have been used by a number of workers; in one, the yarn is forced by

(continued on page 18)

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Is This the Year of Decision?

Editorial by Mr. William J. Erwin, President and Treasurer, Dan River Mills, Danville, Virginia, for **The Bobbin & Beaker** Magazine, Clemson School of Textiles.

All signs point to 1955 as a year of momentous decision for the textile industry of the United States. It may be momentous, too, for millions of cotton farmers, chemical producers, machinery makers, transportation workers — for all who supply and service our nation's textile mills.

Within a matter of months, the American people will face a showdown on foreign trade policy. The decision will have to be made between one of two major courses. Which choice will the Congress make? The future of a great industry, linked with many other industries vital to the nation's economy, hangs on the answer.

One choice will be to continue the kind of "free trade" doctrine that virtually limits the abolition of tariffs to the United States alone, ignoring the many different barriers to trade which foreign countries erect. In essence, this doctrine blames the American tariff system as the "root of all evil" and assumes that throwing the doors wide open to American markets will solve the world's economic problems.

Since the middle 1930's the official U. S. policy has been to reduce American tariffs and thereby induce other countries to do likewise. The United States has accelerated that policy by turning over its tariff negotiations to a supra--national agency known as GATT (General Agreement on Tariffs and Trade). But, as so often happens, practice proves different from policy. The rules and regulations of GATT actually invite the repudiation of trade agreement commitments. GATT, in practice—and this is the factual bitter experience of the textile industry—fosters the continuation of trade discriminations and artificial trade barriers of every type.

This, then, is the course of futility and disaster. As far as international trade in textiles is concerned, this policy has already proved itself futile. It has promoted the flow of foreign-made goods to richly provisioned America instead of to the destitute regions where people need clothing most. And insofar as the United States economy is concerned—the mills and allied manufacturing and agricultural industries involving millions of American wage earners—this is truly the course of disaster.

Whether the U. S. textile industry surrenders its markets, production and employment piecemeal, bit by bit over the years as has been done during the past decade, or suddenly, overnight, the consequences will be equally disastrous. And make no mistake about it, the reduction or elimination of tariffs under present world conditions has only one outcome—the transfer of American production to the industries of foreign countries.

Current government reports on industry earnings amply demonstrate the precarious economic position of the textile industry today. American mills simply have no unexpended margin of profit that can help them meet the lower prices of low-wage foreign industries on competitive goods. Present tariff rates, already whittled down a full one-third on textiles, have long since proved inadequate to stem the inrush of fabrics from foreign mills whose productive efficiencies are rapidly increasing.

Already the American market is the most accessible, the easiest to enter, in the world. Yet the pressure is on to throw the doors open still wider. How can mills of this country survive under such circumstances? The fundamental dynamic of all American industry is growth, expansion today based on tomorrow's promise. All the building of new plants, the installation of new machinery, all the research to develop new products which will create new sales and new jobs, all the efforts to advertise and promote the distribution of goods—all such planning stems from confidence in the future. But how can an industry like textiles make such plans when facing the uncertain future, as dictated by our foreign trade policy?

Stagnation, at best—complete collapse, at worst—can be the only prospect for the textile industry of this country if our government decides to follow the course of unrequited ground-giving in foreign trade. Meanwhile, the world-wide economic sickness—bad money, non-competitive production and maldistribution of gooods—can only become worse.

The time is long overdue for the new vision, a change of spirit, in American foreign trade policy. There is a second choice which the Congress and our trade policy officials can make. They can decide on a course of action to wipe out artificial trade barriers and exorbitant tariffs, eliminate discriminatory practices, and persuade foreign governments to put their own economic houses in order.

Such a course will be one of promise for the entire world, and for the basic industries of America as well. It involves the establishment of true reciprocity in international trade affairs. It will require tariff bargaining strictly on a country-by-country basis so as to maintain the principle of mutual exchange and to restore the sanctity of international contractual obligations.

If such a choice is to be made, many people must remove their blinders. They must understand that complete accessby foreign industries to American markets is far from being a panacea which will automatically cure the world's economic ailments. They must see that offering the United States as a substitute market for foreign textile industries will in no way help the people of Asia, Africa and South America become better clothed. They must recognize the folly of discussing American tariff reductions as a material factor in correcting trade distortions so long as economic affairs are dominated by socialistic theories of controlled currencies, cartels, monopolistic prices, inconvertible money, discriminatory export and import duties, and all the rest.

Whichever choice is finally made, the decision will be momentous. One course portends the loss, soon or later but eventually, of the textile industry as we know it in the United States. The other course, one which will require courage and foresight of a high order, offers America both the responsibilities and rewards of leadership toward building a richer, stronger, happier world.

It must be quite clear what course you should support.

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Opportunity Unlimited . . .

By E. H. Hines, Jr.
General Manager
McCormick Spinning Mills, Inc.

It is my understanding that THE BOBBIN & BEAKER is published primarily to serve the Clemson Textile students and as a result, the thoughts in this article are being directed to that group of readers.

In the past few years there has been a great deal of concern among the textile industry and its leaders about the great scarcity of technically trained young men and women going into the textile industry and of its phases. The leaders of the textile industry recognize the great need that our industry has for this type of person and are seeking to find ways and means to interest more young people in a career in the textile industry.

One of the many reasons why the demand has increased for college trained men and women, particularly those trained in the technical arts, has been the rapid expansion of all our industries and their need and demand for more technically trained people. Some of these industries have been in a position to offer to the college graduate a somewhat better starting rate of pay than the textile industry has been able to offer, primarily because their entire wage structure has been further advanced than the textile industry. This has had considerable appeal to the young men and women coming out of college in recent years because it enabled them to start off with a little better standard of living than could be managed on a starting salary for college graduates in the textile industry. There have been exceptions to this, of course. It also enabled the college graduate to start a home at an earlier date and to get married at an earlier age. Statistics show that there has been a considerable increase in marriages among college graduates immediately after leaving college in recent years, and this trend has even gone into the colleges among the students, so that we now find college graduates coming out of school in many cases with considerable more responsibilities and financial burden than they had in previous years.

This has probably caused a greater percentage of the college graduates to go into the other industrial fields in preference to the textile industry; however, it is my belief based on information that I have read from time to time that this factor may be misleading to a lot of college graduates. In studying the progress that has been made in the textile industry in the last twenty years we find that the minimum wage in the textile industry has increased at a much higher rate than any other industry in the country, having increased approximately 500% during that period of time with further increases in the minimum wage being discussed at the present. In many of the other industries because they have, over the period of time since World War II, secured a higher percentage than the textile industry, their demands for college graduates have fallen off somewhat and also their requirements are not quite as great as previously.

While we have not made a study in any detail of the other industries, except through casual observations, we have made studies in the textile industry and know that of the college graduates entering into the textile industry, by and large progress has been very rapid for those people who apply themselves diligently to their jobs. In the Fall Issue of the BOBBIN & BEAKER, you will recall an article by Dr. R. G. Carson, Jr., setting forth very clearly a study he had made concerning salaries of textile graduates from Clemson and I quote from this article: "Seven years after graduation, at least fifty percent of the graduates were earning more than $6,000.00 per year, and nineteen years after graduation at least fifty percent were earning more than $10.000.00 per year, and fourteen percent of the graduates out of school twenty years were earning more than $20,000.00 per year." This indicates that there is a tremendous amount of opportunity in the textile industry for college graduates to earn considerably more than the average for all industrial groups. This is one way of measuring the **"opportunity unlimited"** in the textile industry.

In the last twenty years there has been what could be considered a revolution in textiles. This was caused by the advent of the man-made fibers; the first sucessful man-made fibers being rayon. This was followed by nylon and in recnt years Dacron, Orlon and others, and it looks as if there will be many new fibers yet coming out of the test tubes. Along with these man-made fibers came a multitude of problems for the textile industry in general. First of all, the producers of these fibers had considerable problems to overcome before the fibers could be produced commercially and even after the producers considered they had the fibers at the commercial stage, the problems were just beginning for the manufacturers of yarns and fabrics from these fibers. The dyers and finishers of these yarns and fabrics then had to create suitable dyeing and finishing techniques so that these fibers would have sufficient appeal to the consumer in order that they would sell successfully.

When one stops to realize that the natural fibers have been in use for hundreds of years and with all of the progress that has been made in the processing and manufacturing of the natural fibers, there still remains many problems unsolved in connection with these fibers, it is very evident that the man-made fibers must have a multitude of problems yet unsolved in their use because they are still infants in the textile field, however, growing at a rapid rate. Consumer's acceptance of these fibers and fabrics made from them, either in 100% form or in blends with the natural fibers, during the last ten years has been phenomenal. Any person in industry knows that oportunity for an individual lies where there are vexatious and multiple problems to be solved. In the manufacture and use of the man-made fibers, the textile industry does not have past experience of many years to guide them and the solution of the problem in using these fibers must be pioneered from the beginning and new methods and techniques worked out. For that reason alone, the need for technically trained people has increased greatly in the textile industry.

During World War II our textile industry expanded their production in order to take care of not only the needs of our armed forces but those of our allies in many instances. During the same time, the population of our country increased considerably and it is forecast a further considerable increase during the next twenty years. With this expansion of our industry came the requirements for additional people to manage and supervise the departments finishing the increased production along with a considerable demand for increase in selling personnel in order to merchandise this increased production that be-

(continued on page 12)

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OPPORTUNITY UNLIMITED

(continued from page 11)

came available for civilian use after the end of World War II. This created a further demand for people who had college training and background that would be in a position to manage and supervise an industry that had grown to be very technical and highly productive, creating further opportunity for college graduates in the textile industry.

In the last twenty years, there has been more effort devoted to improving textile machinery even to the introduction of new types of equipment and processes to handle the man-made synthetics that we had had in the previous fifty years. This type of equipment requires in many cases a highly trained person who understands this improved machinery and how to get the best from it and the care and maintenance and operation that is required in order to have the production more effective. It also required technically trained supervisors to operate a more complex, higher productive type of machinery. Tremendous amounts of money are continuing to be spent in the development of new machines and improvements of the processes, and we shall see great strides in this direction in the coming years as the textile industry has lagged considerably behind other industries in the development of their machinery. This is going to offer opportunity unlimited to the college graduates in the textile industry.

The age in which we are living has been frequently referred to as the machine age and for many, many years the prime concern of industry in general was the development and utilization of better and better machinery. In recent years there has become a great awarenesss on the part of the leaders of industry that possibly too much attention has been devoted to the human elements in industry. Industry has found that in spite of the best machinery that can be developed there still has to be people capable of operating this equipment for it to produce efficiently and that while a machine can be set up on a standard method of operation and every machine of that same type can be set up on similar standard, each person is an individual and no two can be treated in the same manner and the same results be produced. There has been a great amount of research and study devoted to learning more about the human element in industry and how it can be utilized for the greatest good to all concerned. During these studies it has been found that here we are dealing with the most complex element of all in industry. As a result, we have seen more and more effort devoted in our colleges and universities towards training the students in the direction of understanding psychology and how this can be used properly. The need for people in industry who have an understanding of this element has increased tremendously. There was a period of time in industry when the supervisor had only to speak and the employee carried out the command. This is no longer true in the bulk of industry, and this fact is being recognized more and more every day by the leaders of industry everywhere. Today in order for a person to be successful in industry, if he is going into an operation where he will have supervision of people, he must have the ability, understanding and knowledge of how to lead people and not drive them if he expects to accomplish results. Here again is a problem that creates **"opportunity unlimited"** in the textile industry.

During the few years that I have been in the textile industry, I have seen and known many college graduates to make the mistake of considering their starting rate of pay when they were entering industry as being the outstanding factor in their decision as to what type of job they elected to accept. In my opinion regardless of the industry into which any college graduate might. enter, this is a very serious mistake. In many cases when this factor is considered first, it prevents industry having the opportunity to move the college graduates around into the various operations allowing that person to gain a well-rounded knowledge of the many different phases that go into making up the whole operation and unless this kind of experience is obtained it is a handicap to later progress on the part of any individual. This well-rounded experience cannot be secured from text books or purchased with money and can only come through industry having the opportunity to shift the college graduate from job to job so that that person can have the opportunity to acquire the actual experience. The greatest lack that we have today in the textile industry among our college graduates now employed is a well-rounded experience and background that enables them to see the overall operation and problems instead of the individual small part that they might be concerned with. For that reason, I would like to recommend that when one is considering his initial employment that his prime consideration should be to go along with a company who has a policy of offering opportunity of the nature outlined above.

It has further been my observation that only in the initial few years of industry can any person afford to accept a job in this light for the further along one gets, the greater are the responsibilities of home and family, thereby creating a greater requirement for more financial security. So it is doubly important that this be considered in the first few years in industry.

I hope the reader has noticed that at no place in this article have I mentioned that this opportunity was confined to textile school graduates. We have found in the textile industry whether it be in business administration, engineering, arts or science, there has become an increasing awareness in our industry that we have a much better balanced unit if we take the graduates from all of the various branches of educational institutes.

The textile industry is one of the basic industries and therefore should continue to grow and expand with our economy.

In my opinion today the textile industry offers the greatest possibility for opportunity and rapid progress for every individual entering into it, and I hope enough facts have been presented here to get this message across to every reader of this editorial.

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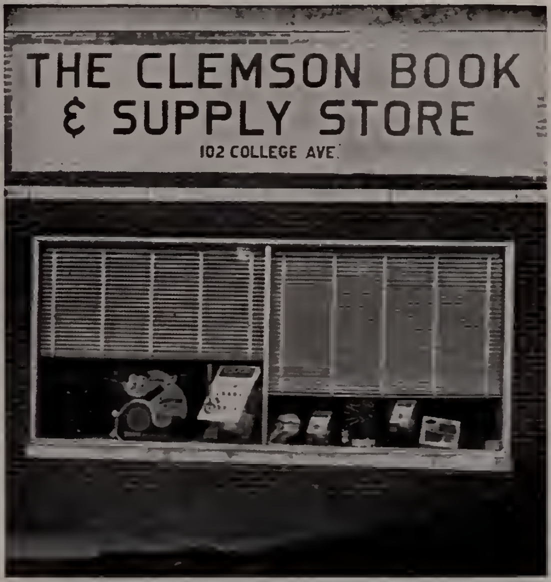

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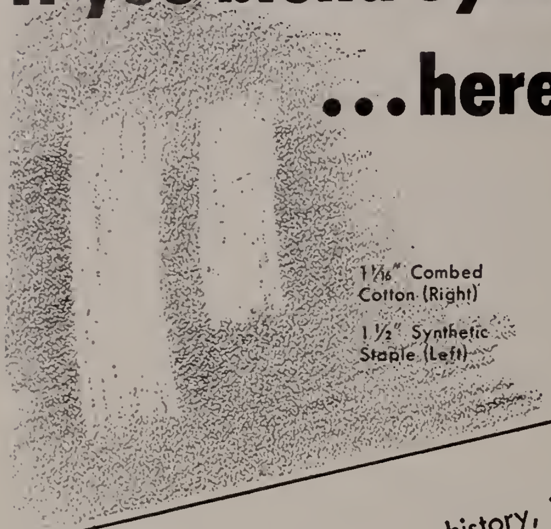

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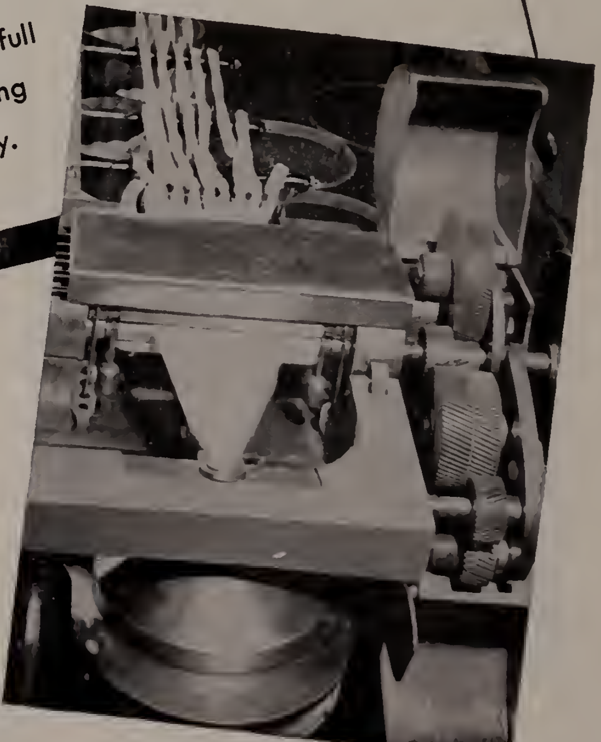

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FRED H. HOPE

Fred H. Hope—A twenty-one year old senior from North Augusta, S. C., is a textile manufacturing major at the School of Textiles. As a hobby, Fred builds speed boats. He holds the rank of Cadet Colonel and is Battalion Commander.

Fred is a member of the Scabbard and Blade, Phi Psi, Business Manager of THE BOBBIN & BEAKER, and Executive Officer of the Pershing Rifles. He was also listed in this year's edition of "Who's Who Among Students in American Colleges and Universities".

During the summer he has been employed by the Seminole Mills at Clearwater, S. C. He plans to enter the Army immediately upon graduation.

Allston T. Mitchell—a textile engineering student from Spartanburg, S. C., is one of the many people that have joined the civilian ranks here at Clemson. In order to learn more about textiles, Allston has worked three summers at Judson Mill in Greenville. He has also worked one summer at Carbide and Carbon Chemical Company in Charleston, W. Va.

Allston is a member of the Varsity Track Team and was also on the Freshman Basketball Team. Naturally, his hobby is sports, both participating and watching.

As President of the Student Body, he is well-known over the entire campus. Allston is a member of the Blue Key, Phi Psi, Block "C" and Phi Kappa Phi. He was also listed in "Who's Who Among Students in American Colleges and Universities".

Allston has won the Owens-Corning Fiberglas scholarship both his Junior and Senior years. Upon graduation in June, he plans to continue his studies as a graduate student.

ALLSTON T. MITCHELL

DONALD S. HARRISON

Donald S. Harrison—a twenty-one year old senior from Brunson, S. C., is one of the outstanding seniors in the School of Textiles. He is a textile manufacturing major and will finish Clemson in June, 1955. After receiving his commission in Armor, he plans to enter the Army on July 1, 1955.

Don is an active member of many clubs on the campus. He is Vice-President of the Senior Class, editor of the Blue Key Directory, and secretary-treasurer of the Central Dance Association. He is also a member of Tiger Brotherhood, Scabbard and Blade and the Senior Platoon.

After his stay in the Army, Don plans to enter the sales division of the textile industry.

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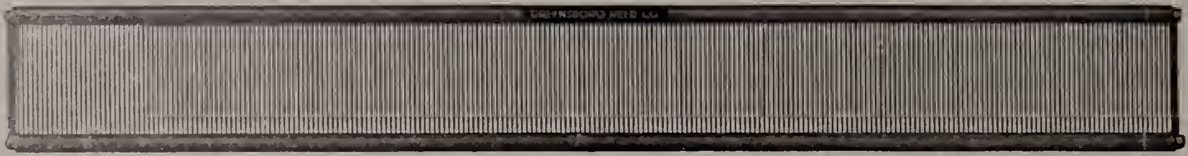

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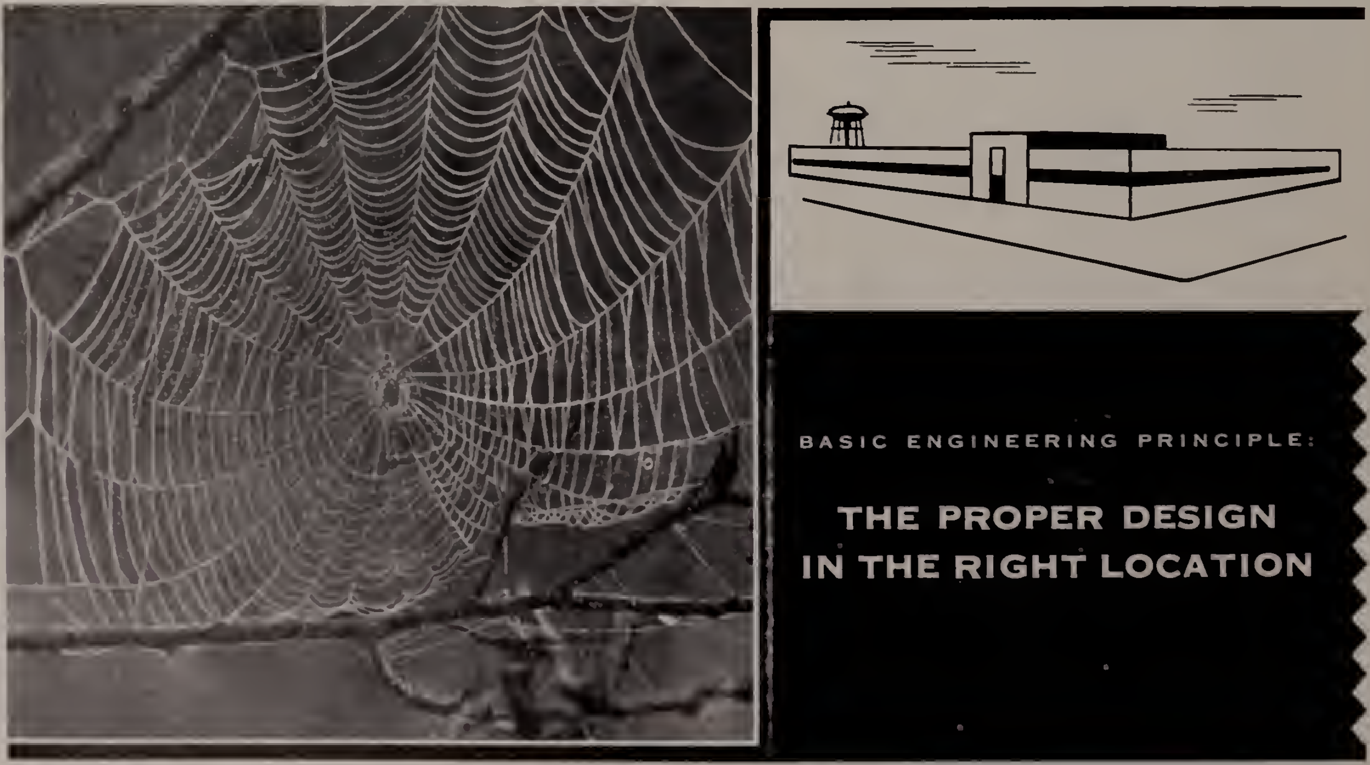
Richard Coker — Traveling is the hobby of Richard Coker, twenty-one year old textile manufacturing senior from Bauta, Cuba. For the past five summers he has been a horseback riding instructor at Camp Pinnacle, camp for boys. Last summer he attended Infantry summer camp at Fort Meade, Maryland.

Richard belongs to N.T.M.S. and Phi Psi, a textile honorary fraternity. He will finish in June and will enter the Army in July.

As advice to freshmen studying textiles, Richard stresses the need of a foreign language, preferably Spanish, because of the fact that more and more jobs in textiles are becoming available in South America.

RICHARD COKER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STERTCH YARN DEVELOPMENTS IN THE SCHOOL OF TEXTILES

(continued from page 6)

means of precision fitting rollers into a heated chamber which has a quantity of stored yarn that impeds the entrance of additional stock. This causes the entering stock to be randomly crimped. At the other end of the chamber the crimped yarn is forced out as rapidly as new yarn is forced in. Adjustment of the pressure of the output gate, and of the rate at which the yarn is removed, determines how tightly the chamber will be "stuffed" with crimped yarn. The plan is sometimes called a **"stuffing box"** method. It is understood that this method is in commercial use. Another principle employed in several patents may be described as a **"shrinking belt" type.** In an over simplified form, it employs an elastic rubber-like belt around a driver and driven pulley. Rotation of the driven pulley is controlled by means of a brake, so that before it can be turned the belt is tightly stretched on the tight side and then shrinks on the loose side. The polished driver pulley is heated, and if the yarn is fed under the belt on the stretched side, it will be crimped as the belt shrinks in passing to the loose side, and may be taken off the belt in the region between the two pulleys. Another variation of this method is to run a thick belt around a small pulley which causes the inside surface to be compressed while making the bend around the small radius. If yarn is fed under the belt, it will be crimped by the compression of the inner surface of the belt as it passes around the pulley. It has been reported that in one European method, yarn is fed into one end of a heated, small bore rotating tube which revolves it into small coils before it is removed from the other end.

This list of methods for making stretch yarn, though by no means covering all the experiments tried at Clemson or methods used in other places, does include those thought to be most promising. Though interesting, some of these may prove to be impractical.

Making Stretch Fabric From Regular Yarn:—Another very interesting development in the School of Textiles is a method of producing stretch fabrics by treatments applied after the fabrics has been knitted from regular yarns. It seems on ladies hose, gloves, etc., made from mono-filament yarns, this can be done very effectively. The method is simplicity itself and entails very little additional costs over the manufacturing of normal hosiery. If the hose is preboarded at 275° to 300° F. on a form only a little over half as wide as the normal form, but proportionately longer, the loops are distorted from the usual rounded form into an elongated, rectangular form. The hose on removal from the form may be as much as 40% to 50% longer and correspondingly smaller in circumference than it will be when worn. Since the elastic effect is primarily lateral, it gives the fabric a **one-way** stretch, and there is a marked tendency for the hose to resist slipping downward. In a number of trials it was found that the hose made by this method remained snug around the ankle and calf of the leg even though not fastened up at all. The wearer could walk or even stamp without the hose spilling down. It has been found that both normal hosiery and hosiery made from stretch yarns will immediately loosen even at the ankle when unfastened, while the one-way stretch hosiery does not loosen below the knee even when the welt slips down around the knee. This method does not produce sufficient elastic effect to permit one size hose to fit an extremely wide range of sizes, but from the customers standpoint, they are not necessarily interested in their hose fitting all persons.

When this method is used on mens' multifilament hosiery, considerable elastic effect can be produced, giving a better fit around the ankle and the calf of the leg, but it is not as pronounced as with monofilament, since it is impossible to bend the multifilament loops as sharply as the single filaments can be bent.

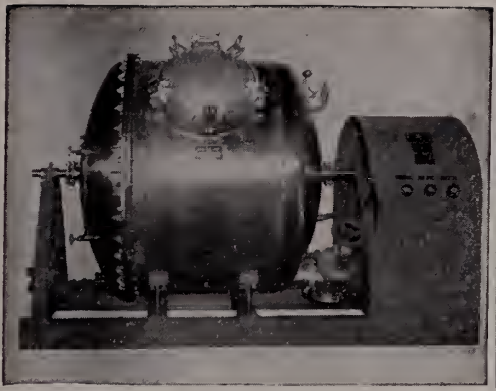
In this method it is essential that the fabric be held tightly in longitudinal direction while the loops are being set, otherwise the fabric will simply shrink due to actual shortening of the yarn in the fabric. The best result is obtained when there is no actual shortening of the yarn and only distortion of the loops occurs. In this method it seems that oversized stockings can be preboarded on the lengthened narrow forms and that they will fit just as well as regular size smaller hose made of normal yarn. This should tend to increase the life of the hosiery manufactured by this method.

It was found that the method works fairly well on finished hose though not quite as much elasticity is given as when they are pre-boarded in the gray.

By using thin lengthened forms hose can be set by means of steam pressing machines or even with ordinary steam irons by using higher than normal temperatures.

It was found that when tricot is given a high tension in the longitudinal direction, letting the width come in accordingly, the loops can be heat set just the same as if garments had been made from such fabrics and heat set on long narrow patterns. The garments, when worn, will give the same type fit as if they had been made from stretch yarns.

Another interesting application of this method was the heat setting of longitudinally stretched knitted tubing, which when unraveled, gives an improved stretch yarn. The crimps in the yarn look very similar to those made by the rectangular toothed gear crimping method.



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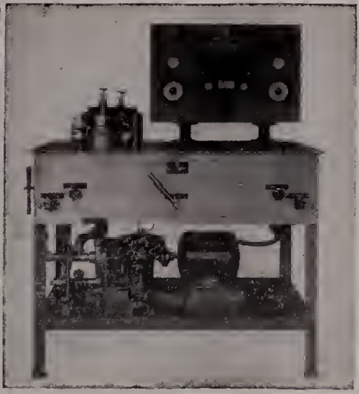
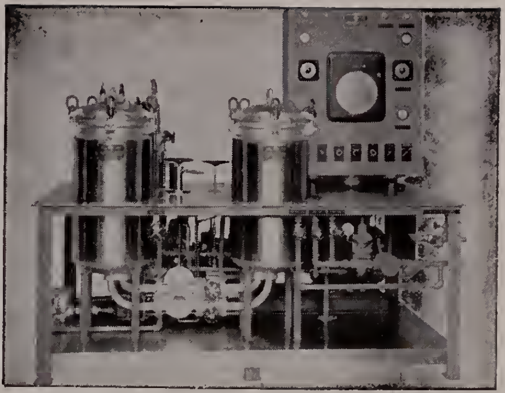


Laboratory Dyeing Machine



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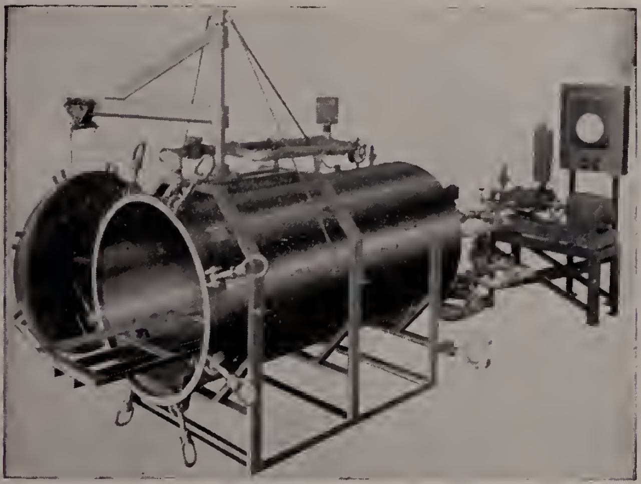

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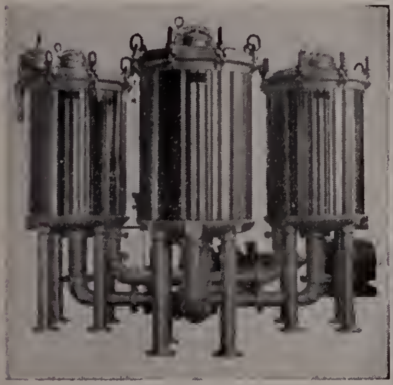
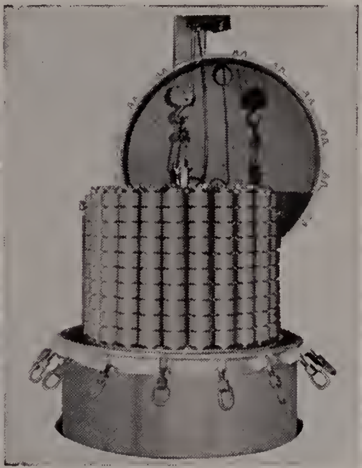


Multiple-Kier Beam and Package Dyeing Machine



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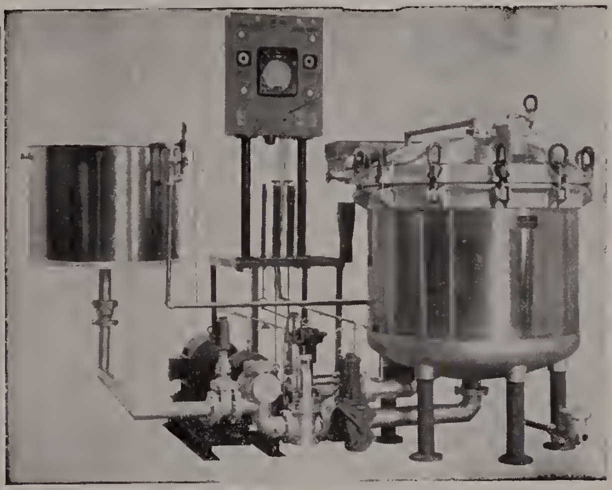

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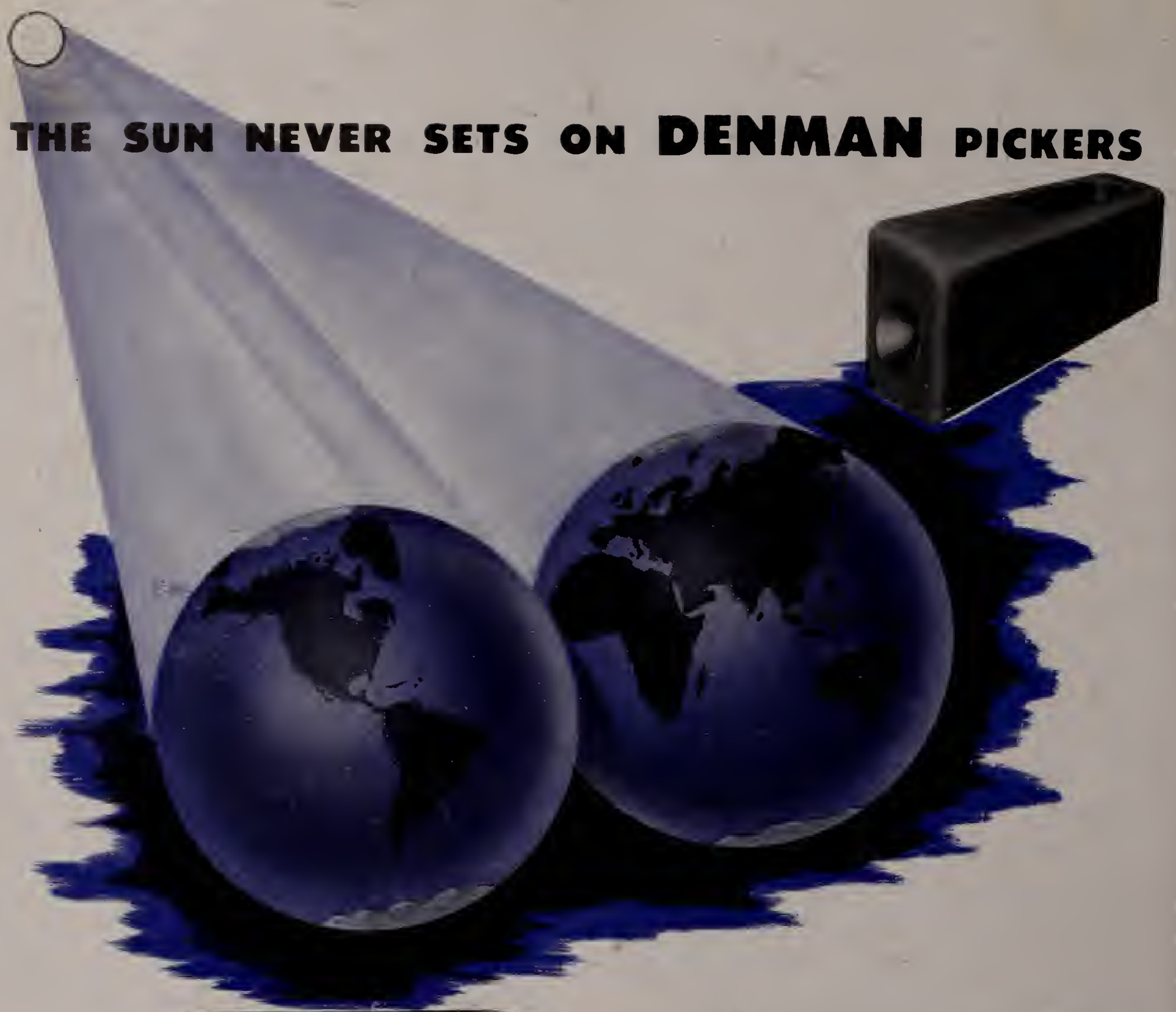

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Official Student Publication
Clemson Textile School

VOL. 13 SUMMER 1955 NO. 4

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THE COVER: My objective was to illustrate implicitly some typical representation of the textile field and at the same time, create an esthetical composition. To do this, two typical traits of the textile department were employed: a bobbin and a segment of a jacquard loom. Photography was used as a medium of expression.

. . . . . . Ted Pappas, '57

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A Method of Reducing Card Waste

By

H. M. Brown, Dean, School of Textiles
J. L. Thompson Assistant Professor
J. S. Graham, Assistant Professor

This is a progress report on a very preliminary card study at the Clemson School of Textiles. The project grew out of the work reported last year on reversing the direction of running card flats. In that study it was noted that running the flats in reverse brought out many pieces of seed coat, trash and tight tufts of unopened cotton, all of which in normal operation go on through the card. More of such trash, etc., can be brought out by running the flats faster in the reversed direction but, of course, this also increases the white waste in the flat strip.

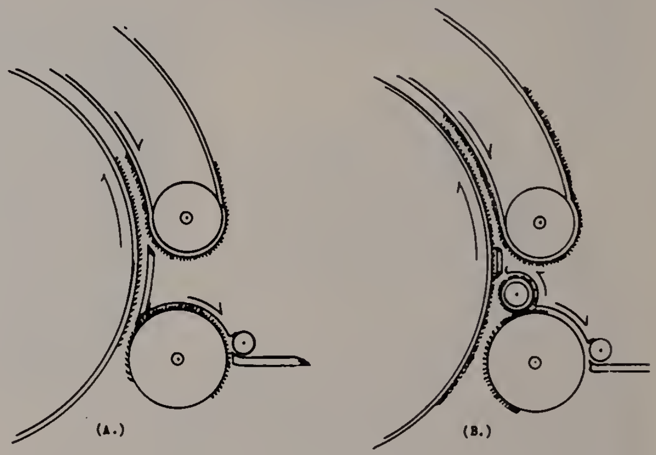
A plan was proposed in which the flats were to be run in two sections. One, a very short section at the rear that would be run at a relatively high rate and the other main section to be run very slowly. The short section would bring out large amounts of the trash and seed coats as well as much lint. But it was planned to put the strip from this section back with the ingoing stock to be reworked by the licker-in. It was hoped the regular flats, never receiving the large pieces of trash, seed coats and etc., might make less neps and certainly less waste.

To divide the flat section in two parts would involve considerable change in the card construction and it was thought, possibly a single, properly clothed cylinder mounted between the licker-in and the regular flat section might serve the same purpose as a separate flat section. The added cylinder would be somewhat in the nature of a worker, but it would be run in the opposite direction.

In considering the problem of stripping this cylinder and returning the strippings to the stock, it was decided, in the first form, to let the waste removal cylinder be stripped by the licker-in itself. (See Figure 1)

The mounting of the waste removal cylinder is very straight forward and the present licker-in cover is replaced with one to cover both the licker-in and added cylinder. Provision is made for settings with respect to both the carding cylinder and the licker-in. A plexiglass window in the housing permits observation of both the waste removal cylinder and the licker-in to see the amount of waste and cotton being returned to the feed plate.

Table 1



(A.) regular card and (B.) card with waste removal cylinder.

Studies were made with two different cottons. All wastes and the card sliver were carefully weighted and analyzed by the Shirley Analyzer. For each type of waste, the motes as percent of the total motes, and the lint in the waste as percent of the total lint fed were determined. Nep counts were also made.

In Table I the motes and lint in each type of waste using the waste removal cylinder are shown as percentages of the corresponding values for the card operating normally. (That is normally except flats were run in reverse direction.) Thus all figures are relative. The results did not turn out as expected. There was no significant reduction in neps and instead of an increase in motes removed there was a decrease, however, there was a surprising reduction in white waste in the mote-box; as high as 60 to 70 per cent and a considerable reduction in total lint loss.

TABLE I

Effect of Trash Removal Cylinder on Card Waste

R.P.M. of Trash Removal Cyl.	Lb./Hr. Prod.	Setting	Percent of Normal Waste					
			Neps in Web	Motes & Fly	Flat Strips	C.&D. Strips	Total Waste	Motes in Sliver
				Motes : Lint	Motes : Lint	Motes : Lint	Motes : Lint	
				Lap A - 1% Motes				
310	6.5	.012	135	97 : 27	112 : 97	153 : 108	105 : 68	89
310	15.5	.012	82	81 : 33	106 : 106	147 : 142	95 : 83	109
310	6.5	.007	135	94 : 50	91 : 92	192 : 122	97 : 78	106
310	15.5	.007	71	70 : 48	103 : 97	158 : 180	89 : 89	120
				Lap B - 1.5% Motes				
310	6.5	.007	94	86 : 53	94 : 89	349 : 121	98 : 85	107
310	14.5	.007	90	87 : 61	98 : 80	143 : 107	97 : 85	107
540	6.5	.007	99	93 : 35	95 : 82	262 : 132	99 : 78	102
540	14.5	.007	101	92 : 44	97 : 82	142 : 96	99 : 80	102

Two questions arose: First, even though there was a definite reduction of large pieces of trash in the flat strip, why was there not more motes in the licker-in waste? Second, since the waste removal cylinder does not act on the cotton until it has passed the licker-in, how can it reduce the loss of lint through the mote knives and licker-in screen?

It was thought the most logical answer to the questions was that the addition of the waste cylinder had in some way altered the air currents around the licker-in. Measurements showed that the air pressure in the mote box without the added cylinder was .004 inches of water and the use of the trash removal cylinder lowered the pressure to .0033 inches. In view of the openings in the walls of the mote box, it seemed surprising that there should be any pressure under the licker-in. The mote box was then sealed with tape and an air tight partition placed across the opening between the chamber under the cylinder and the chamber under the licker-in. Operating the card without the added cylinder produced a pressure of **.0047** under the cylinder and a vacuum of —.032 to —.04 under the licker-in. When the partition was removed the pressure under the licker-in rose to .0033. This shows that in regular card operation air currents created by the cylinder move into the mote box and are drawn through the mote knives and licker-in screen. This air must be carried under the back knife plate along with the cotton carried by the cylinder. In other words the cotton-covered cylinder wipes air under the knife plate and thereby carries it away from the licker-in tending to exhaust the air from the mote box, thus explaining the vacuum produced when the mote box is sealed. Pressure measurements showed this action to be greater when the cylinder carried cotton than when running empty.

When the waste cylinder is added a much narrower back knife plate must be used, and it was thought that possibly this narrower plate might offer less resistance to the passage of air under it, and thus enable more air to be brought through the licker-in screen and mote knives than is the case in the normal operation with a wide knife plate.

To further study the problem it was arranged to vary the pressure in the mote box. With and without the waste removal cylinder an especially trashy cotton was carded with two licker-in speeds at two different pressures in the mote box.

TABLE II

Effect of Waste Removal Cylinder on Card Waste from Lap Containing 5% Waste, 620 RPM Cylinder Set .007 in. —8.5 lb./hr. Production.

In. Pressure in Mote Box	Percent of Normal Waste					
	Neps in Web	Motes & Fly	Flat Strips	C & D Strips	Total Waste	Motes in Sliver
		Motes : Lint	Motes : Lint	Motes : Lint	Motes : Lint	
		460 RPM Licker-In				
.0400	102	88 : 6	121 : 83	181 : 88	95 : 65	178
.0033	109	93 : 41	110 : 74	126 : 79	97 : 66	152
.0025	103	92 : 53	106 : 74	174 : 97	96 : 73	165
		760 RPM Licker-In				
.0023	164	100 : 44	76 : 98	144 : 113	97 : 75	156
.0023	170	99 : 53	85 : 86	149 : 104	98 : 73	149
.0630	143	100 : 30	77 : 94	139 : 104	97 : 64	152

For each licker-in speed, Table II shows the results for three runs with, and three runs without, the waste cylinder. The motes and lint in each type of waste, produced when using the waste cylinder, are shown as percentages of the corresponding valves given without the device. Several effects should be noted:

1. For the normal licker-in speed there was:
   - (a) an increase in motes in flat strip, in cylinder strip, and in the sliver, but only a small reduction of motes in the licker-in waste
   - (b) a large reduction in lint in the licker-in waste and a considerable reduction of lint in the flat strip, cylinder strip, and in total lint loss
   - (c) lower lint loss in the mote box with higher mote box pressure
   - (d) a slightly higher nep count
2. For the high speed licker-in there was:
   - (a) more motes in cylinder strip, in sliver and no change in motes for the licker-in waste and less motes in flat strip, giving a very slight decrease in total motes removed by the card.

(b) a considerable reduction of lint in all forms of waste except cylinder strip

3. The flat strip was free of large pieces of trash and unopened cotton.

It was thought if use of the waste cylinder resulted in different air currents through the licker-in screen and mote knives that using air pressures under the licker-in might produce somewhat the same results. This was tried and the effects of only adding air pressure under the licker-in, making no other changes in the card, are shown in Table III. It is noted that for the normal speed licker-in there was a large reduction in lint in the licker-in waste and some reduction in all wastes, giving a considerable total lint savings. The total saving in lint was as great as that for the waste removal cylinder used without added pressure and there was practically no impairment of mote removal

TABLE III

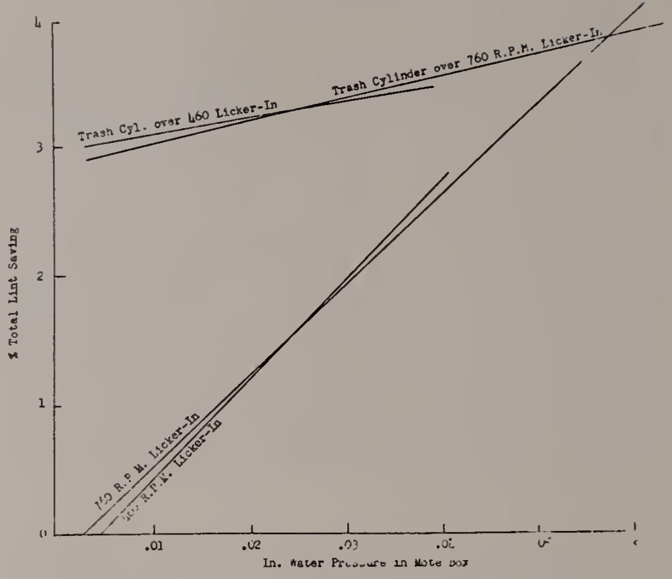
Effect of Pressure in Mote Box on Card Waste from Lap Containing 5% Waste (Production: 8.5 lb./hr.)

<table>
<tr><th rowspan="3">In. Pressure in Mote Box</th><th colspan="10">Percent of Normal Waste</th></tr>
<tr><th rowspan="2">Neps in Web</th><th colspan="2">Motes & Fly</th><th colspan="2">Flat Strips</th><th colspan="2">C.&D. Strips</th><th colspan="2">Total Waste</th><th rowspan="2">Motes in Sliver</th></tr>
<tr><th>Motes</th><th>Lint</th><th>Motes</th><th>Lint</th><th>Motes</th><th>Lint</th><th>Motes</th><th>Lint</th></tr>
<tr><td>.04000</td><td>84</td><td>98</td><td>36</td><td>106</td><td>79</td><td>126</td><td>97</td><td>99.8</td><td>71</td><td>104</td></tr>
<tr><td></td><td></td><td colspan="6">760 R.P.M. Licker-In</td><td></td><td></td><td></td></tr>
<tr><td>.06300</td><td>107</td><td>100</td><td>29</td><td>99</td><td>117</td><td>104</td><td>109</td><td>99.5</td><td>75</td><td>110</td></tr>
</table>

For the high speed licker-in the use of added mote box pressure gave as good mote removal and total lint saving as were given by the waste removal cylinder, and in the licker-in waste the reduction of lint loss was greater than that obtained with the waste cylinder. Also, the use of air pressure in the mote box did not seem to give quite as many neps as the operation using the waste cylinder. On the other hand addition of air pressure alone does not reduce the amount of larger trash reaching the flats.

Thus it is seen that a lint saving can be had by use of either the waste removal cylinder or by increased pressure in the mote box. Possibly the improvement by the waste cylinder is mainly due to resultant changes in air currents around the licker-in that occur with its use. It is believed that these changes in air flow may be caused by the altered back knife plate and this point is to be given more study. In Figure 2 the lint saving for the whole card is plotted against the mote box pressure.

Table 2



Due to the relative worthlessness of licker-in waste the lint saving here is the most important and Figure 3 shows the per cent savings by use of air pressure and by waste cylinder.

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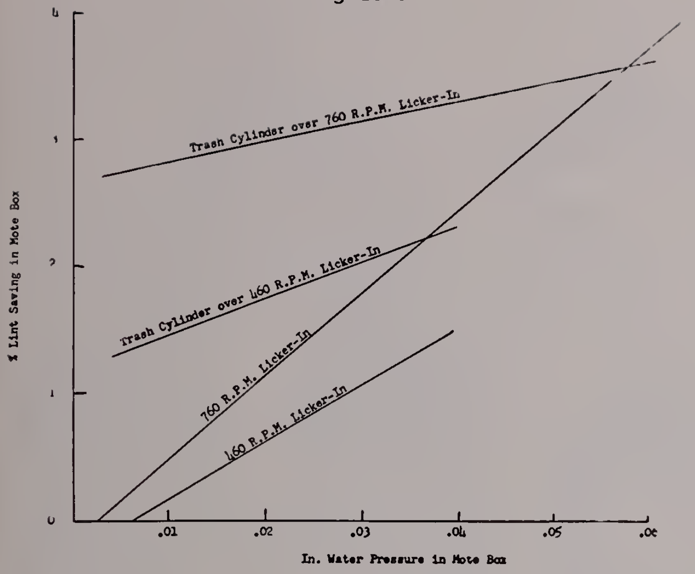
Mills Mill No. 1—Greenville, S. C.; Mills Mill No. 2—Woodruff S. C.; Eagle & Phenix Mills, Columbus, Ga.; Saxon Mills, Spartanburg, S. C.; Chesnee Mills, Chesnee, S. C.; Grace Mill, Rutherfordton, N. C.; Osage Mfg. Co., Bessemer City, N. C.; Bishopville Fin. Co., Bishopville, S. C.; Vulcan Rubber Products, Brooklyn, N. Y.; Duroflex, Inc., Buena Vista, Va.; Fairforest Fin. Co., Clevedale, S. C.; Warrior Duck Mills, Clevedale, S. C.

Reeves Brothers, Inc., is an integrated textile organization, formed in 1920 and today comprises nine wholly owned mills and three finishing plants, employing 7,000 people.

REEVES BROTHERS, INC.
Southern Headquarters: Clevedale, S. C.
Main Sales Office, 54 Worth St., N. Y. C.

Figure 3



As is usually the case, savings cost something. The waste tests showed that the above methods slightly increased the motes in the sliver, and spinning tests were run to determine if the final yarn is impaired by the additional trash in the sliver, or by possible fiber damage caused by the waste reduction methods. The yarns were tested for evenness, strength and grade, the results being shown in Tables IV and V. Several effects of using the waste removal cylinder are evident:

TABLE IV

Effect of Trash Removal Cylinder on Spinning Test Results for 36's Yarn from Cotton B.

Speed of Added Cylinder	Carding Performance			Yarn Tests		
	Neps in Card Web	Cleaning Efficiency	Lint Savings	Evenness	Appearance	Skein Strength
R.P.M.	#/100 Sq. In	Percent	Percent	Percent U.	Grade	Lb.
		No Added Cylinder - 6.5 Lb./Hr.				
	54	61		21	D+	51
	Trash Removal Cylinder over Licker-In - 6.5 Lb./Hr.					
310	50	62	.9	22	D+	50
540	53	56	1.3	22	D+	51
	No Added Cylinder - 14.5 Lb./Hr.					
	158	49		23	D	48
	Trash Removal Cylinder over Licker-In - 14.5 Lb./Hr					
310	142	50	.6	22	D	48
540	160	48	.8	23	D	46

TABLE V

Effect of Trash Removal Cylinder on Spinning Test Results for 36's Yarn from Cotton C.

Carding Set-Up		Carding Performance			Yarn Tests		
Licker-In Speed	Mote Box Pressure	Neps in Card Web	Cleaning Efficiency	Lint Savings	Evenness	Appearance	Skein Strength
R.P.M.	In. Water	#/100 sq.in.	Percent	Percent	Percent U.	Grade	Lb.
			No Added Cylinder				
460	.0025	63	94		21	C	61.2
460	.0400	58	94	2.7	19	C+	64.2
760	.0025	46	95		19	C+	63.0
760	.0630	55	95	4.3	20	C	62.3
		Trash Removal Cylinder over Licker-In					
460	.0025	60	90	2.7	22	C	61.2
460	.0400	51	90	3.5	20	C	61.4
760	.0023	74	93	2.9	22	D+	58.2
760	.0630	79	93	4.0	21	D+	59.0

1. For the normal speed licker-in, at two different production rates, Cotton B showed no appreciable change in yarn strength, evenness, or grade, due to use of the waste cylinder. It is believed the additional motes in the sliver are of such character that most of them may be lost during later phases of processing.

2. For Cotton C, at normal mote box pressure and licker-in speed, the use of the waste cylinder did not impair yarn.

3. At higher pressure under the licker-in run at normal speed the waste cylinder seemed to slightly reduce yarn strength, grade and evenness.

4. With the high speed licker-in at both air pressures the waste cylinder gave a small reduction in strength, grade and evenness.

It is not thought that impairment of the sliver or yarn is inherent with the method. It is feared that the waste cylinder may have been run at too high a speed and that the type of clothing may not have been best for the purpose so that there was impairment in some cases. In previous work where large trash, etc., was brought out by reversing the motion of the flats, the sliver was improved even when the flat strip was fed back in with the lap. It should be realized that this study has only begun and it is believed that at a very low cost a worthwhile lint saving may be had without impairment of the sliver. There are yet to be tried many things such as different speeds, settings, types of clothing, diferent arrangements of air flow and shape of housing, etc.

What Does One of Clemson's Most Successful Textile Graduates Think of the Prospects for Young Men and Women of Today?

Is there still such a thing as an Age of Opportunity or has that vanished with the changing times in this era we know as the Atomic Age?

Asked that question recently, William H. Grier '23, executive vice-president of the Rock Hill Printing and Finishing Company, replied: "The opportunity for success has never been brighter. Of course, we live in an age of change. But there are certain fundamentals essential to success which will never change. The successful people I have known in my lifetime all had one trait in common. They were willing to work hard. Loyalty, honesty, energy, ambition, and the desire to work are basic requirements for anyone seeking success."

Grier continued: "Our modern way of life seems to have had quite an impact upon the thinking of many of our younger people. We seem to be thinking more and more of a way of life that provides something for nothing. It just doesn't work out that way. Today a fellow who is willing to work hard often finds competition at a new low."

Asked what he would do if he were just leaving college, Grier answered: "I would find a job with a well-organized company and I would study that company just as hard as it studied my own application. I would want to know if it was progressive, wide-thinking, and if it occupied a field with wide horizons. Then I would learn as much about my field as I possibly could and when opportunity knocked, as it practically always does, I would attempt to make the most of that opportunity."

About this time of year 32 years ago, Grier, a young Clemson College cadet, was looking forward to graduation. And, like most of the students of today, he was wondering about the future and what awaited him in the world of business and industry.

Today this same Grier is head of the largest textile printing and finishing plant in the world. The plant Grier heads employs more than 3,300 persons. It can finish more than two million yards of fine cotton and rayon cloth a day, covers more than two million square feet, and uses more electricity than the city of Rock Hill with its 30,000 population.

In addition to being executive vice president and general manager of the Rock Hill plant and a director of M. Lowenstein and Sons, Inc., he has also been active in civic and educational work. He is a former chairman of the Clemson Board of Visitors, is now a member of the Board of Trustees of Winthrop College, and a director of the Charlotte Branch of the Federal Reserve System. He is an elder in the Oakland Avenue Presbyterian Church, a trustee of the Rock Hill Elks Lodge, and has served on many boards and committees of various organizations. A new addition to the Rock Hill plant is now being built and will be named the Grier Division of the Rock Hill Printing and Finishing Co.

(Seated) Emil Stahl; (Left to right) Charlie Davis, Bob Huey, Stanley Reeves, R. P. Moore; (Not present) M. C. Morgan and J. E. Bishop.

A New Staff Takes Over

The staff of THE BOBBIN & BEAKER has had some changes made since the last issue of the publication. The new staff members are: Emil Stahl, Editor, of Elmhurst, Long Island, N. Y.; M. C. Morgan, Managing Editor, of Great Falls, S. C.; Richard C. Moore, Business Manager, of Pendleton, S. C.; Charles A. Davis, Advertising Manager, of Fairforest, S. C.; Stanley J. Reeves, Assistant Circulation Manager, of Heath Springs, S. C.; and Robert B. Huey, Photographer of Cheraw, S. C.

Mr. Stahl is a rising senior in textile manufacturing and was employeed in the Men's Wear Division of Burlington Mills, Inc., in New York. Mr. Moore has been employed in the Gerrish-Milliken Mill of Excelsior Finishing Plant and is a rising senior. J. P. Stevens & Co. Inc., has employed Mr. Morgan for three summers, and he is a rising junior. Mr. Davis has worked in the Fairforest Finishing Company and Warrior Duck Mills and is a rising senior. The Kershaw plant of Springs Mills has employed Mr. Reeves for two summers and he is a rising senior. Mr. Huey is a textile chemistry major and has been employed by the Chesterfield Hosiery Mill, Chesterfield, S. C., for two summers.

A Visit to the Adam French Textile School

By Thomas F. Ballentine, Instructor of Knitting

Many students, after having completed part of their textile course here at Clemson, often wonder if other textile schools are similar to it. Questions concerning equipment, course requirements and methods of teaching form the greater part of this natural curiosity.

Recently, I was invited to tour the Adam French Textile School at Georgia Institute of Technology. Since my visit was on Saturday and after classes were over for the week, there was no opportunity to talk to members of the faculty.

The school is located in a spacious, partly air-conditioned building of very beautiful, modernistic design. Most of the offices are located at the front of the building. The laboratories are air-conditioned and makes work a bit easier on hot, spring days, as well as the cold winter days. The laboratories are arranged in order of processing and are divided into two catergories. On one side of the building is the machinery required for processing cotton. The other side contains machinery used for processing synthetics (rayon). This arrangement enables the students to study and compare both systems very easily.

It must be kept in mind that Georgia Tech is primarily an engineering school, therefore we can understand that manufacturing of any type must take a back seat to the engineering curriculum. However, make no mistake about it, Georgia Tech has excellent equipment for its needs in the textile field. In some departments they exceed us, but for the most part their equipment is older than that found at Clemson. Even so, equipment of considerably earlier vintage is still being used in many of our mills.

I was particularly interested in the Knitting Department at Georgia Tech. The knitting courses taught there are: flat knitting and circular knitting. They have no knitting option and their courses are for the most part, elementary. There are two knitting labs which contain Scott & Williams B-5 machines, a 400-needle women's circular hosiery machine set up to make mesh hose, a small tricot machine of the type we have, assorted ribbers, and bodywear machines. They also have three or four Tompkins knitting machines which were very interesting. These machines utilize the spring-beard needles which are stationary, all knitting action is accomplished by burr-wheels which work between the needles. The fabrics is knit upside down and inside out and is taken up on a roll above the machine.

Many people get a big laugh at the old hand looms that are used in the designing courses. Actually, they are very good for teaching the fundamentals of fabric design. The lab contains about twenty-five of these machines, each of which is equipped with a dobby head. Designs made in theory are installed on these looms and the student produces several inches of each type of cloth during his lab period. This type of design course with the practical touch creates more interest and at the same time, conveys the principle of weaving very effectively.

The testing lab is also interesting. It is much larger than our lab and has a separate air-conditioning system. The students have plenty of space in which to work and equipment to fill every testing need. The chemistry labs are set up similar to ours and are about the same size as the microscopy lab.

Some of the machines in the various labs are very interesting. For instance, they have a wool card which takes the raw stock in a breaker at one end and moves it through three-roll top cylinders, delivering a strand similar to roving. In conjunction with this the product of the card is wound on a spool which is then placed on a wool-spinning frame which has a draft of about .5. Incidently, they have another spinning frame which is really a mechanical wonder. It has a variable speed motor, a drafting system that can be changed at will simply by turning a small crank, an extra long traverse and other devices both electrical and mechanical.

A good tour through the French School of Textiles requires about two hours. Even this cannot give a complete picture. Confined by the limits of an article, the picture is even more distorted but perhaps it will convey a general idea of our neighboring textile school. The only fair treatment would be to visit the school itself.

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(Left to right) Dean Hugh M. Brown, Mr. Ellison S. McKissick, Dr. R. F. Poole, and David R. Gentry.

Phi Psi News

David Gentry, President, Iota Chapter

Iota Chapter of Phi Psi Fraternity began this year with eighteen members after June and August graduation. This number was increased in December with the addition of twenty-five new members, one of the largest groups ever to pledge to the chapter, and we were all very happy to have this group join with us. A stag smoker was held on March 28 for prospective members and nine men were interested in joining. This will bring our membership total to fifty-two, the largest it has been in several years. From the increased number of students eligible to become members of the fraternity, it is easy to see that the scholastic average of the textile student body is rising considerably. We sincerely hope that it will continue to rise.

The chapter has recently conducted the professor rating poll, a project which was adopted two years ago. We feel that it was successful again this year in that it has given the professors a chance to note places where improvement might be made and it has provided an opportunity to compare these ratings with the ratings received in the first poll that was held. We appreciate very much the cooperation we received from the faculty and the students while it was being carried out.

During February, a group of Phi Psi members made a trip to the Fiberglas Plant in Anderson. This was carried out as a special project which would give each of the fellows a chance at seeing first hand a complete synthetic yarn manufacturing process. Other trips such as this are contemplated in the near future and we hope to visit a complete cloth manufacturing plant so that most of the manufacturing processes may be viewed.

The chapter held a banquet on February 25 in the Purple Room of the Clemson House to honor Mr. Ellison S. McKissick, President of the South Carolina Textile Manufacturers Association, who was awarded an honorary membership degree at that time by Dr. Hugh M. Brown. Approximately forty-four persons were present and Dr. R. F. Poole made several remarks following the dinner. Our spring banquet has been planned for May 13 and it will be held in the Gold Room at the Clemson House.

We were very fortunate recently in having our new tile floor installed. This was a gift from the Textile School, and we received very helpful assistance from Professors H. B. Wilson and John L. Thompson in laying the tile. This has improved the appearance of the room quite a bit.

The national convention of Phi Psi was held on April 14, 15, and 16 in Brookline, Massachusetts. Three members from Clemson attended and they were accompanied by Dr. W. T. Rainey, Jr., the Faculty Advisor. It was a most enjoyable trip, and we hope that next year a larger number will attend. Next year's convention has been tentatively set to be held at Auburn, Alabama, with Lambda Chapter as host.

Balance in Teaching

Roscoe J. Breazeale
Instructor, Textile Chemistry & Chemistry

Today we are living in troubled and uneasy times as so often in the past. This is particularly true on the international level. At home we hear men of national prominence speak for actions of government which are directly opposed to our American way of life. We are disillusioned almost daily by those who for personal ambition and power will sacrifice ideals and friends.

Collegiate sports do a great deal toward inculcating fair play and sportsmanship, yet now and then we hear of instances where athletes have "sold out". In some sports we sometimes see athletes ganging up on a member of the opposing team. While these cases are few, we must admit there is room for improvement.

We all realize the temptations and pressures on young men to find the easy way out, or to seek personal advantages at the expense of others. Industrial management and college administrations alike face these problems daily. Have we become mechanistic in our programs and careless in our attitude? How can we keep alive the realization that pride and sincerity of purpose in doing a first class job should transcend all else in our professional and personal relations? How may we assure the desired results in the education of men in the field of textiles?

A college education in textiles should give a background of facts and techniques whereby an individual can carry out worthwhile tasks or attain a higher level of contribution to the industry as the result of their application.

The teacher must strive not only to teach these facts and techniques, but must also make a determined effort to instill an inquiring state of mind and to illustrate thorough and independent work by example. Much that the college professors do today may not bear fruit until years later.

College professors cannot do the entire job. Much of the students's attitude is an expression of ideas and habits of elementary and high school. After college, the textile graduates who enter industry will be influenced by the young men who are superintendents, overseers, or second hands. Perhaps they have a greater influence than one may realize at first. They set the example of pride in a job well done at a time when the hopes and expectations of the new man are highest. To the leaders in industry falls the responsibility of realizing that those working under them expect some measure of sincerity of purpose and pride in a job thoroughly done.

It is relatively easy to teach technical skills, we do this almost every day. It is much more difficult to instill top quality sincerity in professional and personal relations. Perhaps this can best be done by example. I believe that the future attitudes of textile men are dependent in large measure on today's teachers and industrial leaders alike.

We can and must set high standards for work well done. It is not enough to get a few facts and ideas from textbooks, we must make a conscientious effort to offset indifference, insincerity, and distortion of thought and fact. Almost daily we talk to students about jobs in industry. There conversations influence the attitude the student acquires toward his future activity in industry. In these daily associations of student and professor much can be done to build up the desirable and eliminate qualities of the student. Let's keep in mind that we are training leaders of tomorrow.

QUALITY CONTROL CONFERENCE MEETS AT CLEMSON

By M. C. Morgan, Managing Editor

After a round of tours at area mills, the 225 members attending the fifth annual conference of the American Society for Quality Control, settled down to a day of talks. The conference lasted from January 27 through 29 and was held at the Clemson House.

The first program starting the Saturday session was "Quality Control in Testing and Research." Chairman at this meeting was H. K. Hughes, Summit Research Laboratory, Celanese Corporation of America. Following this was "Control of Tire Cord Testing" by Frank Akutowicz. American Viscose Corporation, Marcus Hook Pennsylvania, and "Evolution of Evenness Testers" by W T. Walters, School of Textiles, N. C. State College, Raleigh, North Carolina.

Just prior to lunch, task group meetings were held on cotton raw stock staple fiber picker laps, staple sliver and roving, staple fiber yarn, educational films and fabric imperfections.

Starting the evening session there were three separate talks under the heading of "Quality Control in Processing." Chairman for this session was Samuel B. King, Limestone Manufacturing Company, Gaffney, S. C. Featured on the program were "Process Controls" by Norbert L. Enrick, Institute of Textile Technology, Charlottesville, Virginia; "Carding and Spinning Process as Related to Quality", by Joseph Delaney, Superintendent of Joanna Cotton Mills, Joanna, S C.; and "Quality is Our Problem", by W. H. Esslinger, Quality Control Coordinator, Central Mill Office, Anderson, S C.

Educational sessions were held on Saturday from 9:00 A.M. to 10:30 A.M. David S. Chambers of the University of Tennessee was chairman and leaders were Thomas B. Baimbridge, Tennessee Eastman Corporation, Kingsport, Tennessee, and John V. Brookshire, Jr., Owens-Corning Fiberglas Corporation, Anderson, S. C.

Dr. Robert G. Carson, formerly of the Clemson Textile School staff was the overall chairman of the conference.

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N. T. M. S. News

N.T.M.S., the Clemson School's only professional fraternity, is guided by a member of the Textile School Faculty, Mr. E. A. LaRoche, serving as the Faculty Advisor. The membership of the fraternity is open to all textile students of the upper three classes; sophomore, juniors and seniors.

As a social function this year, we, in conjunction with Phi Psi, had an "open-house" during Homecoming Week-end, in order that all interested persons might look over the Textile School.

The National Textile Manufacturing Society has in its first five years striven to give textile students a little more than can be obtained from books. In attempting to do this, men from the profession are asked to come and speak to the students on the jobs and problems they are most familiar with. Among others, Mr. C. G. Johnson of Deering-Milliken, talked to us and had as his topic, "What Is Expected From Graduates." By getting this first-hand information we feel that we are much better prepared to go into the textile business.

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On Education For Industry

John C. Shell, Assistant Professor of Textiles

Our most recent addition to the Textile School Faculty is Professor John C. Shell, class of 1938. Professor Shell worked with Burlington Mills from 1938-42 in Greensboro, N. C., Fayetteville, N. C., and New York City. He served in the U. S. Army from 1942-47 and was awarded the Legion of Merit medal. He was discharged with the rank of Major. After his career in the army, he worked with Deering-Milliken at Judson Mills, Greenville, S. C., as assistant director of the laboratory. From 1950-54, he was assistant superintendent at Gerrish-Milliken Mill, Pendleton, S. C. Professor Shell joined the faculty at the School of Textiles in February in February, 1955.

In the textile industry today, as in all other industries as well, there is a great demand for technically trained college graduates. This demand does not exist because of a need for the knowledge of a particular trade that the graduate has accumulated during his college course. This type of information is more readily and completely available from the men already in industry who have learned well in the great school of practical experience. Instead, the demand for the technically trained graduate exists because of the never ending need in industry for men who, because of their college training, are capable of thinking technically as well as otherwise and thereby offer potentials of leadership that all industry requires.

The primary purpose of education in our scheme of things is the training of the human mind and only secondarily the recording of specific facts into our memories. According to Webster, education is "the systematic development and cultivation of the normal powers of intellect, feeling, and conduct, so as to render them efficient in some particular form of living, or for life in general." It is sad indeed that many students go through their college careers content to pursue only that small part of education that results from the study of textbooks, the assimilation of lectures, and the recitation in the classroom of the information so gained. Ralph Waldo Emerson, the famous American poet and essayist, once wrote: "You send your child to the schoolmaster, but 'tis the schoolboys who educate him. You send him to the Latin class, but much of his tuition comes, on the way to school, from the shop-windows."

The textile industry today, unlike its counterpart of a generation ago, attaches far more importance to the ability of a person to get along with other people than to technical knowledge alone. The cultivation of this ability is that very important part of the educational process that can best be developed by the student through his taking advantage of those aspects of campus life not found in the prescribed curriculum. These could well include participation toward leadership in all forms of student activity from the "bull session" to clubs and societies, ROTC, YMCA and other religious groups as well as participation in sports and encouragement of the social graces.

As far as courses of study are concerned, the student should take as electives as many subjects as possible which will assist him to better understand the complexity of the human personality and of the society in which we live. To express the above in words far superior to m yown, I use the words of the English historian, Edward Gibbon, who said: the first from his teachers; the second, more personal and important, from himself."

The graduate entering industry should certainly aim for an ultimate career as a part of management and should therefore keep in mind that a good supervisor is one "who gets the people in his department to do what he wants done, when he wants it done, in the way that it should be done, because they want to do it." The last phrase, "because they want to do it", sums up what is meant by the ability of a person to get along with other people.

An occasional technical graduate enters upon his industrial career with a somewhat superior feeling akin to that of the returning veteran who felt that, because of his sacrifice for his country, the world owed him a living. This attitude bring to mind the words of W. G. Sumner, who said: "The men who start out with the notion that the world owes them a living generally find that the world pays it debt in the penitentiary o rthe poor house." This type of person would perhaps also have a tendency to flaunt his learning before others and should take the advice of Lord Chesterfield, the English statesman and author, who wrote these words to his son: "Wear your learning, like a watch, in a private pocket; do not pull it out and strike it, merely to show that you have one. If you are asked what o'clock it is, tell it; but do not proclaim it hourly and unasked like the watchman."

A college diploma will help its owner to receive opportunities not often afforded to others, however it is strictly up to the man to carry on from there. Success in any field of endeavor awaits the man who enters into his work with humility of spirit, earnestness of purpose, and an awareness of the Biblical admonition in Proverbs: "Wisdom is the principal thing; therefore get wisdom; and with all thy getting get understanding."

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DR HUGH M. BROWN
Dean, School of Textiles

Two years ago the board of trustees of the Sirrine Foundation decided to help defray the cost of publishing The Bobbin and Beaker in the hope it could be enlarged and that four issues would be published every year. It was realized that since the magazine is distributed free, returns from advertising might not always cover the expenses. Also it was decided the key editorial staff should be paid modest honorariums. To accomplish these ends, the Sirrine Foundation underwrites costs not covered by advertising. This makes the magazine a thorough going organization.

Both the Bobbin and Beaker staff and the Textile School express their appreciation for this valuable contribution from the Sirrine Foundation.

This aid to the Textile School is just the latest of several ways in which the Sirrine Foundation benefits the School of Textiles. These include: (1) enhancement of the state retirement for textile staff members; (2) enhancement of the college travel funds to aid professors in visiting textile plants; (3) to employ professors to work on research during the summer months; (4) annual contributions to our textile library for employing a librarian and providing funds for the purchase of many books which would not otherwise be available.

It is believed that all of these aids have been a very large factor in strengthening our staff and the school effectiveness.

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New Industrial Management Course Is Offered at Clemson

By Charles Davis, Advertising Manager

(Taken from supplementary bulletin published March 1955)

This course has been created by the college to meet an increasing demand in the South for personnel trained to follow careers associated with business and industry. The Industrial Management curriculum, a four year course, will be offered at Clemson College beginning in September, 1955.

The purpose of this course is to put special emphasis on preparation for management in industry and business. This course recognizes the need for an understanding of the basic principles of science and engineering underlying industrial operations, an appreciation of the nature of human beings, and the comprehension of the economic, political, and social development. This curriculum provides courses needed to prepare students for future positions in industry and business.

Twelve of the twenty-four approved electives must be selected from certain designated course groups. These groups are arranged to emphasize a particular phase of training. If the student wishes to emphasize the textile phase, he would take the courses in the textile group. Other groups of approved electives are designed for those students wishing to emphasize the various technical aspects of their education.

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Office Notes

By Emil Stahl, Editor

It is the aim of our relatively new staff to bring you, our readers, a magazine that will prove both factual and interesting. It is our intention to bring to light all information that will be pertinent to the textile industry.

THE BOBBIN & BEAKER is primarily a student publication, but this does not limit our articles to those written by students only. THE BOBBIN & BEAKER tries to cover all phases of the textile industry. As students, we can only qualify to write on very general terms, so we look toward the men in the various technical branches of this vast industry to furnish material that will prove interesting to our readers.

We like to think of our magazine as serving as a medium through which our readers may learn the latest developments in the industry. As such, we offer our facilities for rendering such a service to our readers. One need only to submit a rough draft and the staff will prepare it in a form suitable for publishing, thereupon being returned to the author for approval and published in the earliest issue.

We are sincerely looking forward to featuring more guest articles in future issues.

To date the circulation list of THE BOBBIN & BEAKER entails some 1700 subscribers. We feel proud of the fact that there exists so much interest in our student journal, and it is our desire that this number will continue to increase.

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Dean Brown on European Tour

Representatives of the National Council for Textile Education sailed on April 9, on the S. S. United States for a several weeks tour of Europe.

Dr. Hugh M. Brown, dean of the School of Textiles at Clemson is among the nine people making the trip. Also on the tour is Malcolm E. Campbell, a 1930 graduate of Clemson, and now dean of textiles at N. C. State College in Raleigh.

The group will visit technological educational and industrial centers in France, Switzerland, West Germany, Belgium and Great Britain. Consultations will be had with officials of textile educational institutions, research organizations, textile mills, textile machinery manufacturers and others.

On the continent, highlights of the trip will be the conference on the Institute Textile re France in Paris and a meeting in Roubaix with French textile school and manufacturing officials.

While in Great Britain the national council will hold a joint meeting with British textile school officials at Harrogate. The group will visit the Leicester College of Technology, Leeds University, the British Rayon Research Center, the Bradford College of Technology Textile School and the British Industry Research Association.

They will also visit the International Wool Secretariat and Torridon (wool research center) and the tour will be closed by attending the four-day meeting of the British Textile Institute in London.

The national council is comprised of deans of the leading textile schools of the United States and others interested in the advancement of textile education. Its overall objectives are to study and apply where possible improvements in textile and technological educational curricular, procedures and administration in order to supply the textile and allied industrial with personnel better qualified to meet the needs of this important segment of the national economy.

The European trip is designed to further advance these objectives by an on-the-spot observation of work being done by similar groups of other countries. The trip was made possible through the cooperation of a number of companies in the textile and allied industries.

In addition to Deans Brown and Compbell and Mr. Hayward, President of the NCTE and also president of Philadelphia Textile Institute, others on the tour are Cleveland L. Adams, director, School of Textile Technology, Auburn, Auburn, Ala.; Mrs. Mildred Andrews, executive secretary, American Textile Machinery Assn., Vienna, Va.; Leslie B. Coombs, president, Bradford Durfee Technical Institute, Fall River, Mass.; Julian Jacobs, editor, Textile Research Journal, Textile Research Institute, New York; Dr. Martin J. Lydon, President, Lowell Technological Institute, Lowell, Mass.; and Edward T. Pickard, executive secretary, Textile Foundation, Kent, Conn.

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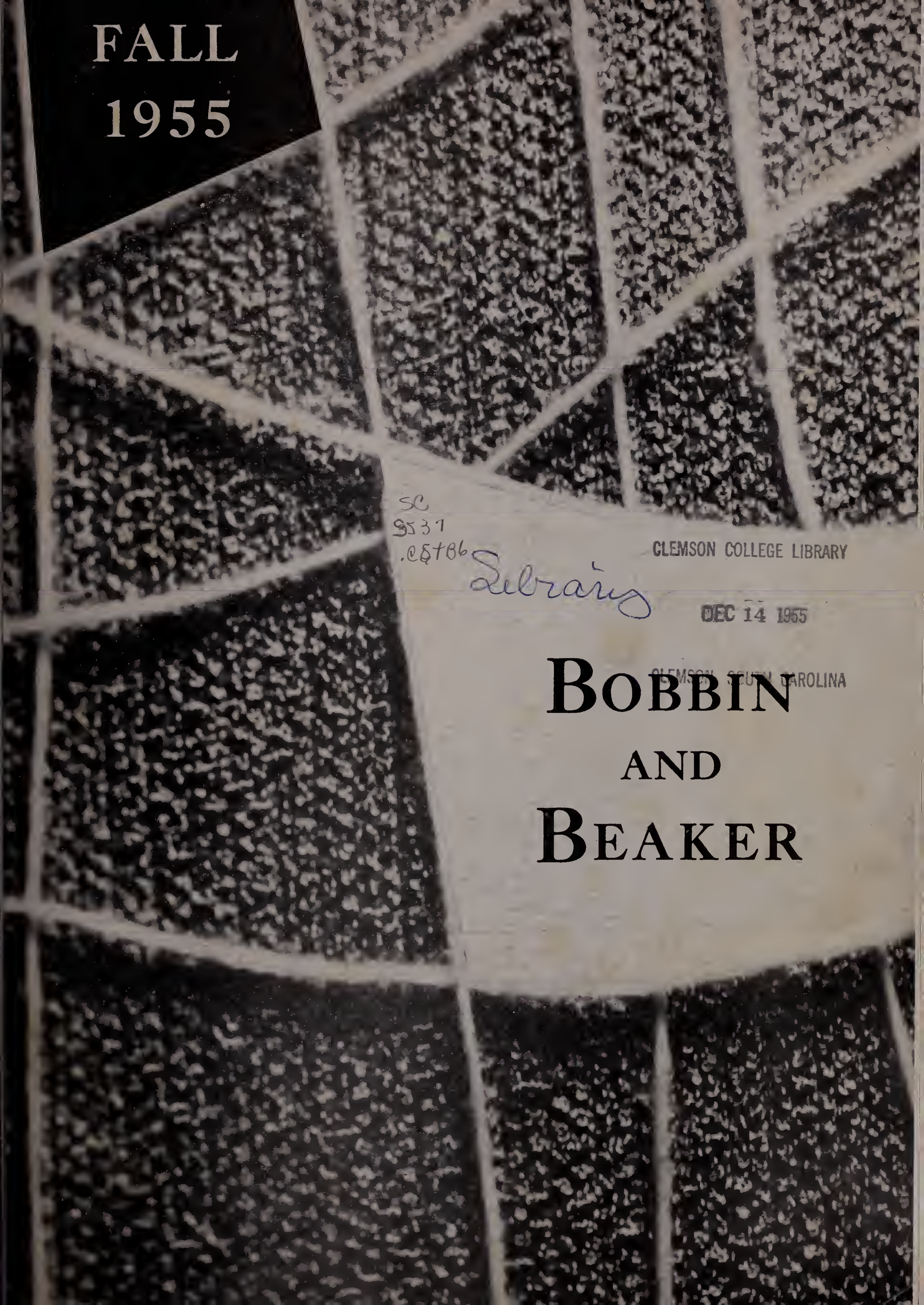

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THE COVER: "Composition of Lines and Textures." This composition was created through the use of cotton roving for the lines, and a broadweave drape for the texture. . . . Ted Pappas '57

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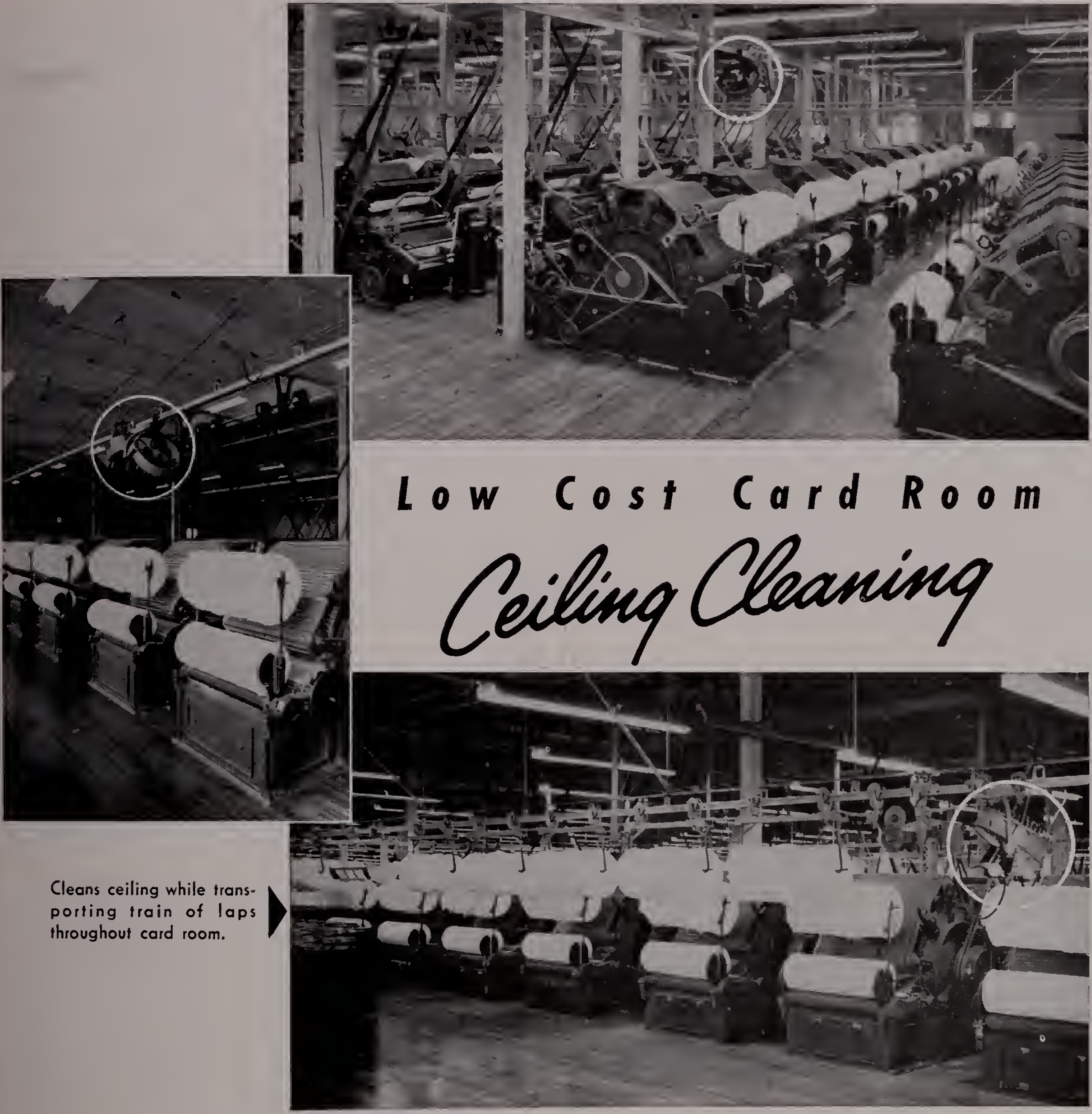

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Textile Schools and Research Abroad

Hugh M. Brown, Dean
School of Textiles

In April and May the National Council for Textile Education held its Spring meeting in England with its associate members from the British textile schools. The twelve American textile schools were represented by eight school heads or officials that were able to go. The trip was sponsored almost completely by textile and textile machinery companies. The group toured in the countries of France, Switzerland, Germany, Belgium and England, visiting mainly the outstanding textile schools and textile research organizations, and was extended a most gracious welcome and generous hospitality at every stop.

To me the most outstanding impressions were:

1. Evidence of a tremendous belief in textile education and research, as shown by the large expansion in building equipment and personnel that has been made since our last trip in 1949.
2. The faith in the schools and research programs is shared by the industry and state to such an extent that in several countries a government levy is collected from the industry and passed back to the schools and research organizations.
3. The schools are almost universally carrying on extensive research programs on fundamental as well as applied research.
4. The research organizations are amply staffed with able, young, well trained scientists.
5. There was a greatly increased trend toward electronic controlled devices and automatic machinery.

The first conferences were held in Paris with a delegation from the French schools and industry, which gave us a picture of textile education throughout that country. The textile education seems to fall in four different categories: (1) Training foremen and lower echelons of management; (2) Professional training of young workers; (3) Technical and professional schools to prepare graduates for positions as mill managers; (4) Newly established training for top management.

The principal schools in France are two in Roubaix, one each in Malhouse, Epinal, Lyons and Rouen, which are all headed up by the Instit Textile in Paris, France, which offers advanced studies. The financial support comes from a legislated tax amounting to 1.23% of each company's payroll.

The starting salary for graduates ranges upward from $150.00 per month. The program in France did not give us an opportunity to visit the schools or mills, devoting the time to conferences with key personnel.

In Switzerland the Zellwegger-Uster Company gave a dramatic demonstration of their various testing and textile machines including the Evenness Tester, Automatic Yarn Strength Tester, Varimeter for measuring picker lap evenness, tying-in-machine, wire-dropping machine and a Spectograph device to quickly show any periodic variations in textile strands. In the display of the Varimeter, part of the equipment was mounted on pickers in a local mill from which signals were brought to a central system by telephone and results recorded on charts in the one laboratory. The system could record results from different mills at any distance by telephone connections.

At a visit at the shops of the John and Jacobs Rieter, textile machinery manufacturers, the group was shown their excellent manufacturing facilities for manufacturing precision cards, combers and drawing and spinning equipment. They stated that several million dollars worth of orders were on hand from the United States.

Though it was not planned to visit many mills, the group did see one of Stoffel's mills in Switzerland. This is the largest cotton manufacturer in Switzerland. The work is concentrated on high style cotton fabrics, a great many of them being clip-spot patterns. Though their labor cost was much higher than in the United States and the orders most of the time so small that only one loom would be put on a style often from one to a few weeks, they stated nevertheless that they were able to sell 20% of their specialty fabrics in the United States.

Professor Honegger, Head of the Swiss Federal Institute of Technology showed much excellent research work especially in the field of x-ray of electron microscopy and some very excellent work with the electron microscope. An interesting feature of their large new chemical laboratory was outdoor laboratories around the side of the building for work with poisonous chemicals.

The Swiss were very friendly toward the United States and the director at Rieter paid high tribute to the contribution in the rehabilitation of Europe by the United States.

In Germany the first visit was to the textile school at Reutlingen, which was celebrating its hundredth year as a textile school and was being given many excellent pieces of equipment by various machinery manufacturers. They had over 700 pupils enrolled in three types of programs: (a) Preparing overseers which required one-half year training after three years practical experience in the plant and a special recommendation from his company (the program for dyeing overseer requires one year study); (b) A program to prepare technicians in spinning, knitting and weaving for applicants having had two years practical experience plus college training; (c) An engineering program for applicants having had two years experience, four years in public school, six years in high school or college. Foreign students are received on the basis that they will encourage purchase of German machinery in their own countries.

There are four other textile schools in Germany, all more narrowly specialized by fiber; wool, spinning and weaving at Aachen; silk, rayon and chemistry at Krefelt; and two schools near Cologne and Wuppertal which specialize in cotton.

For fifty years Reutlingen has specialized in research for the industry. Funds for research come from Wurtemberg and the Federal Republic at Bonn, with some aid from the industry.

The equipment at Reutlingen is highly diversified, having a finishing laboratory of mill size scale resembling a small plant. To obtain the tremendous amount of material required to operate the machines, small job lots for finishing are done for the industry. In the weave room were 60 looms, all different, made by manufacturers in all countries.

In Germany, also, one mill was visited having 70,000 all new spindles operating on two shifts, 42 hours per week each shift. One outstanding machine was a German built roving frame running practically noiselessly and vibration free.

A short visit was made to the great Farbwerke Hoechst A. G., which is a division of the I. G. Farben combine. This is a tremendous chemical concern working in various fields similar to the American DuPont Company, doing over a billion Marks in sales.

The first stop in England was at the Knitting school at the Leicester School of Technology and Commerce. The work is directed largely by College committees, one working with the textile school called, "The Textile Trades Advisory Committee", which is made up of representatives from the employers, trade associations and trade unions. Support comes 40% from Leicester and 60% from the Government plus help from the industry for purchase of equipment. Here, as in all schools visited, the demand for graduates far exceeds the supply. As a direct result of the visit of the American Textile heads to Great Britain in 1949 and a return visit from the British School heads to the United States in 1950, they have formed a British Association of Textile School heads which is a counterpart of our National Council in which it has associate membership. The two groups met at Harrogate for a conference, at which the problems, aims, goals and successes of the various British schools were brought out. The meeting showed very forcibly the greatly increased interest in the British schools and in textile research manifested by much expansion at practically every school since 1950. From the meeting at Harrogate the group continued its tour to visit several of the outstanding schools.

At Leeds University, which is headed by Professor Speakman and Nissan, the group saw building and equipment that has been greatly enlarged, here again having the most excellent textile chemistry and finishing laboratory. Leeds has a total enrollment of 3300 students of which 300 are in textiles. Research funds total more than $100,000 per year and provide for the textile department by University grants from the Wool Research Council and Wool Secretariat. Many fundamental studies are in progress as well as practical studies on moth proofing, wool deterioration, prevention of wool shrinkage and various other modifications to improve the dyeing properties and properties tending to greater consumer service and comfort. In addition to the work on wool there are a great many mechanical developments on yarn manufacturing. Much study is given applications of electronics for use in the industry.

On a visit to the Wool Industry Research Association at Torridon it is found that the industry subscribes $280,000 and the Government $112,000 for research. The Government collects a levy based on the number of operative in the industry and also a levy based on the bales of wool used. Torridon also carries on studies of sheep-breeding at Harrogate. The work at Torridon is carried on with a staff of 200, including 60 with advanced degrees. In addition to fiber research there were many studies on processing equipment, one outstanding device being the Raper-Auto-Leveller Draw Box for levelling variations in wool tops. An interesting study on the molecular study of wool was being made with radioactive tracers.

Again, at Bradford Technological College, they have added a fine new building doubling the size of their plant using funds totaling about $290,000. There the group saw research on x-ray diffraction, intrared spectroscopy, continuous molten metal dyeing, and this school too had a complete finishing range with full scale equipment. The equipment was provided by grants from the industry, the largest from Courtauld's.

The next stop was at the University of Manchester where in the technological college they had also added a complete new dyeing and finishing plant with the addition of 50% expansion for a technological department underway. The finishing plant uses full scale machinery and requires ten to twenty thousand yards of cloth per year for instructional purposes on the machines. There are several items of excellent research being carried on and the department spent $112,000 on new equipment during the last year.

The Shirley Institute is the research center for the British Industry Research Association and here we saw a large new, very modern laboratory. They are operating on a budget of approximately one million dollars a year with 1400 supporting members. When the industry raises $500,000, there is a Government grant of $84,000 and the Government matches all contributions, thereafter. There is a tremendous amount of excellent research going on at this institution, which has developed so many successful instruments that a commercial company has been formed to manufacture and sell the developments to the industry and other laboratories.

The last laboratory visited was the British Rayon Research Association at Heald Green. The rayon producers (Courtauld, Celanese etc.) appropriate ap-

(continued on page 22)

THE STRUCTURE OF FIBERS

By

Dr. A. N. J. Heyn

This is the first in a series of articles concerning the Structure of Fibers which Dr. A. N. J. Heyn has consented to write for THE BOBBIN & BEAKER. Being a comparatively new field of study in textiles, it should prove of great interest to our readers.

Another series will deal with the damage to cotton.

The structure of fibers has many different aspects and comprises, for instance, such relatively crude details as the microscopic properties as well as such fine details as the molecular configuration. The latter structures cannot be directly observed with the ordinary light microscope and are therefore referred to as **sub-microscopic** or "fine" structures. Although the outer microscope features are important, for instance, in connection with special properties such as friction and gloss; the inner sub-microscopic features are of far greater importance since they determine the main physical and physical-chemical properties of the fiber, such as strength, elongation, density, water and dyestuff absorption, etc.

The microscopic structures have been extensively studied in the last century, mainly by botanists and zoologists who described an endless variety of microscopic features of natural fibers. Fibers were found to be built from the same structural units that compose all living matter, namely cells. Animal fibers, and many vegetable fibers are built of a great number of such cells but some vegetable fibers consist only of a single cell, for instance, the cotton fiber.

The fine structure of fibers could not be revealed at that time although various indirect approaches were made. In 1858, Naegeli formulated his famous micellar hypothysis according to which most materials formed by living cells, such as starch grains and cell walls, are built up of small crystalline particles, so called micelles. These particles are larger than molecules but too small to be observed with the light microscope, and were at that time fully hypothetical. Figure 1 illustrates the original theory.

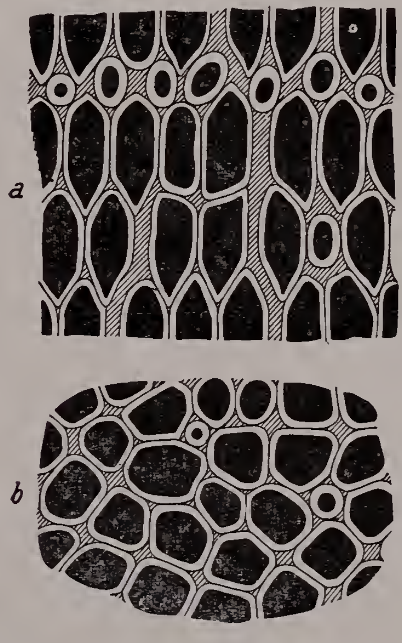

FIGURE 1. Representation of the original micellar theory of Naegeli. (a). longitudinal section and (b) cross section of organized matter.

The crystalline micelles are black; the fixed intermicellar "fluid" is white; the "mobile fluid" between the micelles is shaded. (from C. Naegeli, 1858).

Ambronn has highly contributed to this theory by studying certain optical phenomena of cell walls and plant fibers investigated with polarized light. Such light vibrates only in one plane, whereas ordinary light vibrates in all different planes perpendicular to the direction of propagation. By using this special type of visible light, he obtained indirect proof for the existence of these invisible structural components. He found, for instance, that the absorption and refraction of polarized light by fibers differs as to whether the vibration direction is parallel or perpendicular to the long axis. The same behavior of polarized light was known of crystals. On the basis of these and other ingenious experiments, carried out in the years between 1900 and 1925, Ambronn concluded that some type of crystalline structure must exist in fibers. Since no crystallites could be directly observed under the microscope, he concluded that the crystallites must have sub-microscopic dimensions, thus supporting the micellar theory of Naegeli.

Not until the discovery of x-rays by Roentgen was it possible to further disclose the fine structures of fibers. The reason is that ordinary visible light has too large a wave length for revealing such fine structures. Ordinary light washes around them almost like a hurricane wave around a man on the beach. Since the waves are not affected by the structure they can inversely not give indications for such structures. The fine x-rays, however, which measure about a thousand times less than the visible light do interfere with these fine structures. If they are sent through a crystal, they do not merely pass straight through as ordinary light but by the inter-action with the molecular network of the crystal part of the radiation is directed into other directions. This phenomenon is called diffraction. A photographic plate placed behind the irridated crystal shows a pattern of very typical spots around the original beam. In this way, Von Laue first succeeded to prove the wave nature of x-rays.

The discovery of x-rays offered an opportunity for testing Ambronn's theory of the structure of fibers. In 1920, Scherrer set a fine beam of x-rays across a bundle of cellulose fibers mounted perpendicular to the beam. He obtained a typical diffraction pattern consisting of many arcs and dots around the central beam, similar to the pattern obtained with crystals. This was a magnificent confirmation of the theory of the crystalline structure of fibers.

In the next article we will more extensively discuss the molecular structure of fibers which has been almost completely revealed in the meanwhile by this method and it will be described how, by "looking at fibers with x-rays," it has been possible to determine how the molecules are arranged in the microcrystalline domaines of the fiber.

One great gap remained in the exploration of the fine structure of fibers. Ambronn had an indirect grounds already concluded that the crystalline domaines in fibers must have sub-microscopic dimensions. It remained unknown, however, how these crystalline areas are exactly building up the fiber. It was already assumed by Naegeli that they are embedded in non-crystalline or amorphous material (which latter component he believed to be fluid) so that crystalline and amorphous areas would alternate in the fiber. But nothing distinct was known so far about the detailed configuration of this microcrystalline structure. The extent of the microcrystalline areas, their shape, and their relation to the amorphous areas remained largely unknown.

This important aspect of fiber structure has been investigated in the last few years at Clemson College as part of a program on the structure of fibers. A new x-ray technique was applied for this research study.(1) In the last few years, x-rays had namely been successfully used for measuring the size and dimensions of small particles like carbon-black and other fine powders. It had been found that such small particles cause a complete different phenomenon to occur, than when crystals are irradiated with x-rays. Instead of a crystal diffraction pattern consisting of distinct spots and lines, the radiation is diffusely scattered in this case over a certain area around the original beam, causing a halo around this beam. This phenomenon can be compared with the production of a corona around the moon by the interference of ordinary light with the water droplets of mist. In connection with the narrow angular distance over which the scattering takes place in the case of x-rays, this type of scattering is often called "small angle x-ray scattering.'

Especially Guiner, in France, developed the theory underlying this phenomenon and related the features of the scattering image with the size of the particles which cause it. The mathematical theory is rather complicated and not fully worked out for all cases and will not be discussed here.

In a systematic study of fibers with x-rays at Clemson College, a similar scattering at small angles around the primary beam was observed with fibers but instead of extending in all directions so as to form a circular halo, the radiation extended only along the equator forming a short horizontal line or, in some cases, the pattern of a cross. These observations were the beginning of an extensive study of all different types of fibers with the new small angle x-ray technique.(2) In connection with the small angles within which the observations had to be made a very refined x-ray technique had to be used in which the radiation was focused with crystals so that a very narrow beam was obtained even at the long distance from the fiber.

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(1) The electron microscope has been recently also used for the study of such structure, but is less suitable in so far that the sample has to be disintegrated by mechanical or chemical means for the investigation. This preparation destroys most of the very structures of interest here.

Figure 2 shows the scattering of x-rays obtained with flax fibers in this way. The width of the scattering zone is .60 of a radians. Using the mathematical formulas worked out for this case, it is possible to calculate the exact **size and shape** of the scattering microcrystallites, and to construct a model as if they were directly seen by the human eye. The study of cellulose fibers with this technique shows that these fibers are built of micro-crystallites of a diameter from 20 to 200 Angstrom(3) units and a length about six or ten times this value. For different fiber types, these dimensions differ but they are extremely constant with the same type of fiber. For instance, the diameter of the microcrystallite of jute and flax is 28 A units; of ramie, 45 A; of cotton 55 A. A study of rayons showed that the diameter varies here from 23-45 A depending upon the type of rayon, i.e., the manufacturing process.

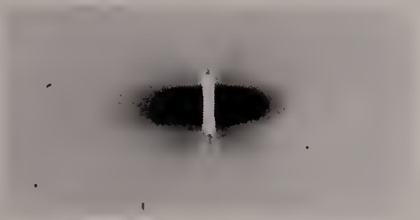

FIGURE 2. Photograph at natural size of the x-ray radiation scattered by a flax fiber at a distance of 200 mm. The white center corresponds to the place of the intercepted beam. The black areas on both sides correspond to the scattered radiation. The total width of the scattering zone is .06 radians (about 3° on both sides).

The scattering is caused by the microcrystallites of the fiber. Their size and distance is determined from the distribution of scattered radiation (from A. N. J. Heyn, 1955(2))

A serious difficulty in evaluating the scattering in terms of crystallite size was originally that the microcrystallites are so tightly packed in the dry fiber that the scattering by the individual particles interferes which causes complications which exclude a simple evaluation. This difficulty was overcome by studying the fiber in swollen condition. By comparing the scattering from the fully swollen and dry material, it was moreover found possible to calculate also the **distance** between the microcrystallites or more correctly, their distribution in space. This distance (measured from center to center of the microcrystallites) was found to depend on the extent of swelling. With jute it was, for instance, 35 A in dry state and 53 in the water swollen condition. With Fortisan rayon, the distance was 45 A in the dry state, 68 in the water swollen condition and 80 A in a solution of alkali. Figure 3 is a schematical representation of the size and distribution of microcrystallites in these two fibers in different conditions. Such absolute quantitative measurements of their microcrystalline components of the fiber has never been possible before.

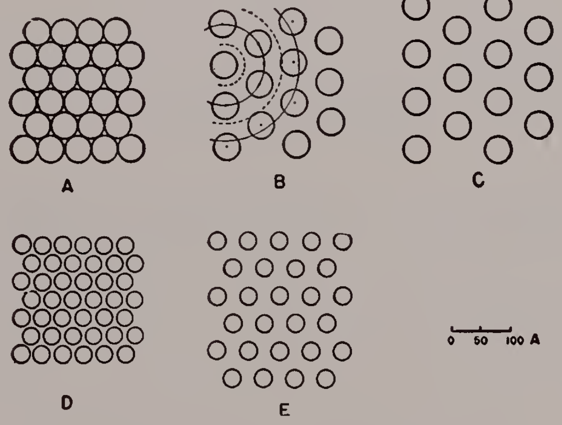

FIGURE 3. Schematical representation of size and distribution of microcrystallites in Fortisan (above) and jute (below). (A) Fortisan dry; (B) same swollen in water; (C) same swollen beyond the water swollen state; (D) jute dry; (E) swollen in water (scale on the right 100A). The circular and equal cross section of the microcrystallites is schematical; their shape and size will actually more or less deviate from this average.

Note different size and distance of the microcrystallites in the different cases (from A. N. J. Heyn, 1955(2))

A fourth feature of the microcrystalline structure of the fiber that could be concluded from the scattering is the orientation. As stated in the beginning, the scattering generally extends in horizontal direction along the equator, forming a short horizontal straight line. In some cases however, a cross was found instead of a single line (Figure 4). This pattern could be related to the orientation of the microcrystallites. If the microcrystallites are oriented ex-

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(2) See reference to footnote.
(3) An Angstrom unit (A) is 10-^{8} cm or 10-^{4} microns-^{7}.

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actly parallel to the long axis of the fiber, a horizontal line is obtained but it can be shown that if they form an angle with the long axis, a cross will result, and in a way, information can be derived for the orientation of the microcrystallites.

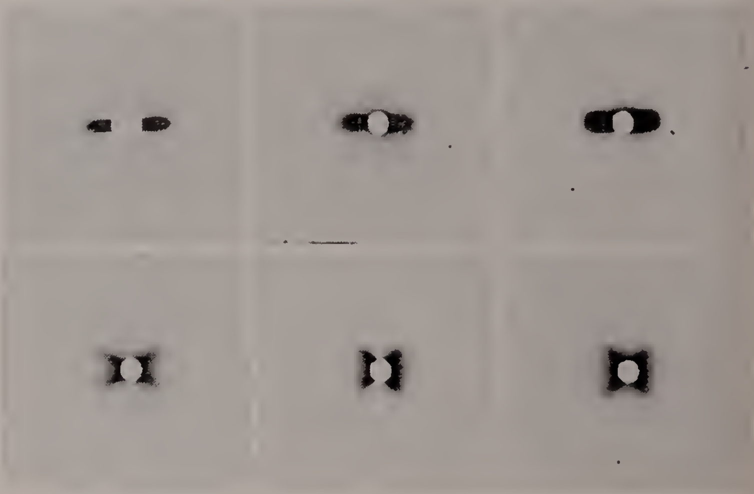

FIGURE 4. Different scattering patterns (crosses) due to different spiral orientation of microcrystallites. The half angle of the cross indicates the spiral pitch (from A. N. J. Heyn, 1949)

By combining the data in this way on diameter, length, distance and orientation of the microcrystallites, a complete picture of the microcrystalline or micellar structure of the fiber has been obtained by this new x-ray method. The results are not only direct proof of the old theory of Naegeli, but also develop this theory quantitatively and modify it on a modern basis.

In the next article, we will discuss a still finer structure of the fiber, namely, the configuration, an arrangement of the molecules in the microcrystalline domaines of the fiber.

REFERENCE TO FOOTNOTE

First publication:

(*) Heyn, A. N. J., "Small Angle X-Ray Scattering of Various Cellulose Fibers," JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, **70**, 3138 (1948).

Latest publication:

Heyn, A. N. J., "Small Particle X-Ray Scattering by Fibers, I Size and Shape of Microcrystallites," JOURNAL OF APPLIED PHYSICS, vol. 26, No. 5, 519-526, May 1955 and "II. Radial Distribution of Microcrystallites," JOURNAL OF APPLIED PHYSICS, vol. 26, No. 9, September 1955.

Selling and Manufacturing Coordination

Within the family framework of American industry, the textiles producing segment has always stood out as being among the most competitive.

With the exception of comparatively brief periods, for all practical purposes the unusual rather than the normal, competition within the textile industry has been constant, leaving only to the alert organization a fair return for their efforts and expenditures.

This is most apparent today as America's manufacturing industries contribute to, and the overwhelming majority share in, the high economic peaks now being realized. While many companies within one overall industry may be enjoying a good profit picture, only a limited number of organizations within the textile industry are showing any appreciable return.

This being the case, the importance of coordinating the very best thinking of the manufacturing and selling staffs, is more than ever a vital part of a company's overall operation. This holds true particularly where you have an integrated operation from yarn to finished fabric.

But, to be most effective, this merchandising-manufacturing program must be flexible. The program that bends, moves forward, always ready to meet demand at the moment a market trend takes form, is the one that will bring results in the profit column. Such is the opinion gathered from the merchandising staff of Burlington Industries and which is reflected in various points covered in this article.

Flexibility, rather than standardization and rules, therefore, must be the key theme. Obviously a program of non-deviation cannot succeed when one realizes that a single company and one loom can produce literally thousands of fabrics, and every fabric, week by week and month by month, is subject to constant change and improvement.

While selling textiles, in the broad sense, does consist of certain axiomatic principles, these are subject to new interpretation as market conditions change. There is no one factor that can be termed most important. Each of the many factors, by themselves, are as important as the other and, in combination, make up a strong, progressive and flexible sales program.

To begin with, and as the hub around which the wheel of the program must revolve, is the inter-relation between the manufacturing and selling staffs, increasingly important in a competitive market.

Conditions being as they are, it is no longer possible to say, as may have been the case during the war years, that what the mill makes, the salesman will sell. On the other hand, the selling staff, being in a sensitive position to understand and spot in advance, market demand and trends, must bring this to the attention of the manufacturing staff. However, it is most important that the selling staff recognize manufacturing limits, including available machinery and yarn supply, as well as other problems faced at the mill level in the production of fabric.

In addition, today's mill operation, as flexible as it may be, is nontheless taxed considerably by such factors as increased use of blends and marked trends away from the staple type of cloths to the semi-novelty items, both in the gray and finished fabric.

With recognition by the selling staff of the problems faced at the manufacturing level and vice versa, sound judgement can be applied to the individual phases of a flexible merchandizing-manufacturing program. They include:

1—Diversification: A sound program of product diversification is one of the strongest forces in a highly competitive market. Where one particular market, for a brief or extended period, lags, the slack can be taken up in other areas, thereby maintaining efforts towards appreciable returns by the overall organization.

2—Market Qualifications: The apparel market is a strict master and the textile producers that serve it must gear production to individual rather than overall areas. A flexible, sound merchandising-manufacturing program must be cognizant of the fact that each area within the overall apparel market is made up of many areas from the standpoint of price and utilitarian requirements. Each price bracket has its individual requirements, each area demands specific cloth, both in construction and style.

3—Research and Development: A glance at your wardrobe will, in itself, be an indication of the importance of this particular area in the overall scheme of manufacturing and merchandizing. While many industries continually work with the same basic materials year in and year out, the textile industry, in just the past few years, has introduced a multitude of fabrics from the man-made fibers, either 100 percent man-made or in combination with the natural fibers.

As far as the textile mill is concerned, the development and eventual production of a new fiber is just the beginning. At this point, concentrated and lengthy research and development effort is required before it can be turned into a proper fabric for proper end use.

And, once this is achieved, this flexible area, coordinating its thinking with other areas within the program, must constantly seek out new combinations, all aimed at producing a fabric that will have better wear and appearance characteristics. Obviously, the company with the more alert, aggressive research and development department will be first with the most and, as a result, capture a healthy share of the market.

4—Styling: Though the fabric itself has all the wear characteristics desired by the consumer, it will get nowhere without the excitement of style in either the weave, pattern or color. Perhaps more so than in other areas, flexibility is absolutely essential here. Styling, to be of the maximum value, should not only spot trends, but initiate them as well.

Once again, the intimate knowledge of individual market areas, its likes and dislikes whether it be a staple, semi-novelty or novelty market and, whether a departure from previous market demand in styling would meet with appreciable acceptance is important.

5—Quality: The good name of the company rests on the quality of the products it produces. In a highly competitive market, there will be found those companies that will sacrifice quality for immediate gain. In the final analysis, however, debasing of a product will eventually result in the debasing of the good name of the company. In this phase of the overall merchandising-manufacturing program, rigid control rather than flexibility is the rule. Quality and the company name will be synonymous only when the product produced offers the very most at fair price levels.

6—Promotion: The various promotional methods, when employed in planned, coordinated manner, act as a vital support to the selling effort by stimulating customer interest. If effective, promotions can place a company's product above the competition and, by creating initial or by maintaining market excitement, it will make the selling job that much easier.

7—Personnel: In the final analysis, it is the individual, who along with his co-workers, forms the backbone of the company and whose energies, skill and allegiance will determine the well-being of the organization. In a period where flexibility is a necessity, an all-around knowledge of the textile industry makes for the greatest individual success and progress.

The day of the specialist is drawing to a close. The salesman, the technician or the manufacturing man who has a working knowledge of all phases of the company operation will reap greater returns.

While the textile industry demands breadth, quick thinking, knowledge and flexibility on the part of personnel, it does offer in return considerably greater rewards to those who get to the top than the averages of other vocations and industries.

While all phases described — diversification, market qualifications, research and development, styling, quality, promotion, personnel — make up the major segments of a flexible manufacturing-sales program, there are others as well. To mention but a few — efficient system of delivery, insuring, where possible, delivery of goods at a previously specified time; meeting individual demands of a customer on specific items; sales training programs, etc.

Without coordination, the various phases that make up a merchandising - manufacturing program have just minimum effectiveness. In combination with each other, however, they serve as a company's most effective weapon in its efforts to capture a fair share of business in a highly competitive market.

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Processing Intimate Blends of "Dacron" Polyester Fiber and Cotton

W. Deane Belcher
Supervisor, Intimate Apparel Merchandising
Textile Fibers Department
E. I. du Pont de Nemours & Co.

This is the first of two articles concerning the blending of Dacron and cotton prepared by the E. I. du Pont de Nemours & Co., for THE BOBBIN & BEAKER. The second article will cover such points of interest as dyeing, finishing, heat setting, singeing and compression shrinkage.

The article should prove of great interest to our readers, students and those directly in the field because of the great part the blending of synthetic and natural fibers has come to play.

Let it not be said that the natural fibers have one foot in the grave and that they are slowly dying out. This is not true and from all available evidence, it will never come true. But it has been proven that with the addition of synthetic fibers with the still popular natural fibers, that the latter can be improved in strength and durability.

. . . The Editor

The trend toward blends of "Dacron" polyester fiber with cotton to combine functionality with aesthetic appeal in shirts, dresses, blouses, and lingerie has aroused widespread interest in techniques for producing quality fabrics and garments in this new and important field. In the production of 100 per cent spun fabrics blended of "Dacron" and cotton for such end uses as shirts, lingerie, blouses and dresses, studies by the Du Pont Company show that a minimum level of 65 per cent "Dacron" is necessary to gain substantial performance benefits from the synthetic.

The 65/35 ratio of "Dacron" and cotton has been widely adopted by mills. At this level there is a good balance of price and performance, with desirable aesthetic qualities in hand and cover.

Production of satisfactory fabrics and garments using a 65/35 blend of "Dacron" and cotton poses no major problems for mill or cutter. As the result of extensive laboratory and production studies, backed by wear tests of finished garments, however, certain specific procedures have been found necessary in the production of fabrics and garments to meet recognized standards of performance and aesthetics.

COTTON SYSTEM PROCESSING

At the present time, both 1.5 denier and 3.0 denier, 1½" "Dacron" are being spun in blends with cotton in various yarn counts:

Yarn Count (c.c)	Denier of "Dacron"	Cotton Staple
up to 30/1	3.0	1-1/8" combed
30/1 to 40/1	1.5	1-1/8" combed
40/1 and up	1.5	1-7/16" - 1-9/16" Pima or Egyptian

Opening and Blending

"Dacron" staple, as received, is in a moderately opened condition and does not require use of standard cotton opening machinery. However, it can be readily processed through synthetic blenders and opening equipment. Whenever possible, it is desirable to blend three or more bales of staple behind the opening or picking line.

Picking

"Dacron" polyester staple can be processed on either one or two process standard synthetic or cotton pickers Kirchner beaters give better opening and subsequently more even laps than pickers equipped with blade or Buckley beaters.

Where high drafts are to be used in roving and spinning, it is advisable to use lubricants on the staple to improve draftability, yarn evenness, and yarn strength. Approximately 0.25% to 0.50% of the lubricant, based on the weight of the stock, can be sprayed on at the picker hopper. For uniform application, two or more spray nozzles should be placed well above the stock as it is being fed into the hopper.

To prevent excessive fiber breakage and elongation, the following picker settings are suggested:

Beater speeds (Kirschner)	— 800 to 900 rpm
Fan speed	— 1500 to 1600 rpm
Beater to feed roll	— 3/8" (first section)
Beater to evener pedal	— 5/16" (second section)
Sargent comb to vertical apron	— 3/16"
Lap pin pressure	— 30 to 40 pounds
Lap weight	— 12 oz./yd.
Lap length	— 30 yards

If laps have a tendency to split during carding, it is advisable to: (1) regulate air currents in the cage section so the bulk of the stock is deposited on the top screen, (2) use split lap preventers behind calendar rolls, (3) increase pressure on calendar rolls,

(4) reduce weight on lap pin by decreasing weight on logger head mechanism or by reducing air pressure if pneumatic loading is used.

Carding

Since properties of "Dacron" polyester staple and cotton are not alike, especially crimp and elongation blending of the fibers is done after "Dacron" polyester staple and cotton are picked and carded separately.

A rayon type lickerin and a fancy roll are highly desirable for carding 1.5 denier staple. However, three denier staple may be carded without a fancy roll if optimum settings are used. This normally requires a more open flats-to-cylinder setting, closer doffer-to-cylinder settings, and higher lickerin speeds. Cards set up as follows (using fancy rolls) will produce sliver of excellent quality from both 1.5 denier, 1½" and 3 denier, 1½" staples.

	1.5 Denier 1½"	**3 Denier 1½"**
1. Clothing wire count		
a. Cylinder	110's	100 to 110's
b. Doffer	120's	110 to 120's
c. Lickerin	No. 1 Rayon wire	No. 1 Rayon wire
d. Fancy	Continuous Knee No. 30	Continuous Knee No. 30
2. Speeds of: (R.P.M.)		
a. Cylinder	165 - 170	165 - 176
b. Lickerin	400 - 450	400
c. Doffer	4.5 to 6.0	8 to 12
d. Fancy	1525 to 1600	1525 to 1600
e. Speed of Flats	2" per minute	2" per minute
3. Settings in thousandths of an inch:		
a. Lickerin to cylinder	.007	.007
b. Feed plate to lickerin	.012	.012 to .015
c. Screen to cylinder		
(front)	.168	.168
(center)	.058	.058
(back)	.029	.029
d. Back plate to cylinder	.029	.029
e. Front plate (top) to cylinder	.034	.034
f. Front plate (bottom) to cylinder	.029	.029
g. Flats to cylinder	.012	.012 to .015
h. Doffer to cylinder	.005 - .007	.005
i. Doffer comb to doffer	.015	.015
j. Fancy to cylinder	1-3/16" strip	1-1/8" or with no fancy use .022 flats to cylinder setting

With these settings, three denier staple has been carded successfully at 8 to 10 lbs./hr. and 1.5 denier at 5 to 6 lbs./hr.

Drawing and Blending

"Dacron" polyester staple is usually blended with the cotton at the breaker drawing. Normally four ends of "Dacron" are blended with two ends of combed cotton, placing slivers of "Dacron" to the outside. In breaker drawing, the sliver will have a wavy appearance caused by the difference in fiber characteristics. However, this waviness will disappear after the finisher drawing.

If the cotton sliver tends to wrap on the top front roll, it may be necessary to rearrange the slivers so both ends of the cotton sliver are fed together in the center. This will minimize any unequal tensions in the web and produce a slightly more even sliver. The tube gear in the coiler head mechanism should be as clean as possible to minimize coiler head jams.

The blending does not necessarily have to be done on the breaker drawing. In some cases, "Dacron" is blended with combed cotton on the sliver lapper if lap back drawing is used.

Blends of "Dacron" polyester staple and cotton have been processed satisfactorily on both "3 over 4" and "4 over 4" drawing frames. For a homogenous blend, both breaker and finisher drawings are usually necessary to prepare a suitable sliver for the roving frame, at the following roll settings:

3 over 4 Drawing	**4 over 4 Drawing**
1st to 3rd 3"	1st to 2nd 1-5/8"
3rd to 4th 1½"	2nd to 3rd 1-3/4"
	3rd to 4th 1-7/8"

Slivers of excellent quality have been produced using a 1-3/8" diameter front roll at a speed of approximately 325 rpm. Tensions should be adjusted to avoid drafting the sliver between the front roll and the trumpet.

Roving

Standard draft and long draft roving equipment is suitable for processing blends of "Dacron" polyester fiber and cotton. The normal front roll speeds for cotton may be used. For counts coarser than 40/1 c. c., one process roving is usually adequate. For the finer counts, (40/1 c. c. and up) two or more roving processes should be used. No more than the minimum twist necessary to hold the roving together should be used. However, it is advisable that a number of twist levels be tried before settling for a given twist multiple.

Spinning

Blends of "Dacron" and cotton can be spun efficiently on all types of cottton spinning frames including frames equipped with conventional drafting elements. As in drawing and roving, roll settings should be carefully checked to avoid any fiber stretching. Front roll and spindle speeds normally used for cotton have been found generally acceptable for blends of "Dacron" and cotton. Travelers should be changed approximately every 72 spinning hours to avoid cut and bruised yarns.

Usually high twist multiples are essential for fabric pill control. A twist multiple of 4.25 or above is suggested as a starting point. Whenever fine counts are being spun, and whenever it is practical a double creel roving improves yarn evenness.

Yarns made from either 100 per cent "Dacron" or 100 per cent cotton are slightly stronger than yarns made from blends of "Dacron" and cotton, particularly blends containing low percentages of "Dacron." This reduction in yarn strength is caused by the differences in fiber elongation and surface characteristics of the two fibers.

Twisting

Spun yarns of "Dacron" polyester staple and cotton can be plied and twisted on all conventional twisting equipment. However, if kinkiness is encountered, it may be necessary to twist set the singles yarn before plying.

Twist Setting

Oven temperatures of 180°F. dry bulb, 170F. wet bulb, for one hour or longer, depending on package size, will prevent kinkiness and liveliness in most yarns. The yarn should be wound on paper tubes or cones to permit it to relax when heated. The packages should be uniform in size and weight. It is not advisable to vary the time in the oven from lot to lot without segregating the production involved.

SIZING

Spun yarns of "Dacron" polyester staple and cotton have been sized successfully with several formulations. However, it is very difficult, if not impossible, to give an exact slashing formula that will be optimum for all warps. The formula will vary with the yarn count, yarn twist, percentage of "Dacron" in the blend, number of warp ends, type and condition of the slashing equipment, etc.

This formulation has given good results when sizing fine count singles yarn:

"Elvanol" 72-60 polyvinyl alcohol[1]	25 pounds
Nu-Film R	110 pounds
Seyco-wax	6-8 pounds
Water	To make 100 gallons

The specific brands of starch and wax that are mentioned are not necessarily the only ones which will give satisfactory results. Further work may show that other brands are equivalent or even superior.

To prepare, add about 2/3 of the total volume of cold water to the make-up kettle and start the agitator. A paddle type agitator is preferred. Add the "Elvanol" polyvinyl alcohol slowly and stir the slurry for five minutes. Wash down the residue that collects on the sides of the kettle. Add the Nu-Film R and stir the slurry for fifteen minutes. Heat the mixture to the boil and stir it at the boil for thirty minutes to dissolve the Nu-Film R. (Heating with live steam rather than a closed coil gives the best results.) Stir in the wax, and add water to make 100 gallons.

Five- and seven-can slashers have given the best results. However, satisfactory results have been given by a two-can slasher. The following slasher conditions can be used for the initial experiments with changes being made as necessary according to the results obtained:

Quetsch roll pressure	900 - 1,000 lbs.
Leases	A wet split is highly desirable in addition to the dry split.
Drying can temperatures°F.	160, 180, 200, 200, 180, 160, cold
Speed	25 - 30 yards/minute
Stretch	0%
Size Pan Temperature °F.	195 - 200

If the yarns pick up too much size, the amount of solids in the size can be reduced. The wax content can be adjusted to give the desired amount of lubrication.

WEAVING

Minimum and uniform tensions should key-note the entire approach to weaving yarns blended of "Dacron" polyester staple and cotton. In general, they will weave well provided (1) the yarns have sufficient strength, (2) the warps have been properly sized, (3) the loom is correctly timed, and careful consideration has been given to (4) the condition of the shuttle, (5) boxing of the shuttle, and (6) the condition of the race-plate. The race-plate should be felt covered.

DYEING

The object of dyeing and finishing any fabric is to improve its attractiveness and serviceability. Since "Dacron" polyester fiber in many fabrics has a tendency to pill, the dyeing and finishing operations should be designated to increase the pilling resistance as much as possible. This is true for blended fabrics of "Dacron" and cotton as well as others. In spun fabrics, the pilling potential will vary with the length and denier of the "Dacron" staple and with yarn twist and construction of the fabric. Thus, the steps necessary in finishing a given fabric will depend largely on its inherent pill resistance.

Desizing

Normal cotton desizing enzymes can be used to remove starch from blended fabrics of "Dacron" polyester fiber and cotton with good results.

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(1) "Elvanol" is the trade-mark for Du Pont's polyvinyl alcohol; Selco-wax is a product of Seydel-Woolley & Co.; Nu-Film R of National Starch Products. The use of polyvinyl alcohol as a textile sizing agent is governed by U.S. patents owned by General Dyestuffs Corp. This information is not to be taken as a license for operation or a recommendation to infringe any existing patents.

Scouring

Most processing sizes and oils and many types of soil are easily removed by mild scouring methods. However, certain types of stains and greases may prove very difficult to remove by standard procedures and more severe treatments may be necessary. The fabric can be padded with an emulsion prepared with 90 parts of a solvent such as Varsol (2) or xylene and 10 parts of a nonionic detergent, (3) and allowed to stand for several hours prior to scouring. Severe grease stains can be spot cleaned with dry cleaning solvents such as "Perclene" (4) perchlorethylene or with solutions of Fels Naphtha soap (5) or "Shasta" (6) shampoo. The soaps should not be allowed to dry and harden on the fabric but should be scoured out soon after treatment. The use of "Hydraphthal" (7) textile processing agent is also suggested for cleaning and spotting fabrics soiled with greases. Two per cent "Hydraphthal" (based on the weight of the goods) can be padded on the goods in emulsion form. The goods are lagged for several hours and then given a regular scour.

Since high temperatures tend to set certain stains in "Dacron," the use of a lukewarm (100-120°F.) pre-scour is important in removing a large portion of the size, dirt, oil, and grease. Very dirty greige goods should not be heat-set prior to scouring. The preferred scour bath for "Dacron" polyester is a water solution of the chemicals listed in this typical scouring formula:

0.1 to 0.2 oz./gal. of a nonionic detergent
0.1 to 0.2 oz./gal. TSPP (tetrasodium pyrophosphate)
0.1 to 0.2 oz/gal. sodium metasilicate
0.003 to 0.006 oz./gal. carboxymethyl cellulose (prevents soil redisposition)

The use of 1.0 percent "Duponol" (8) RA surface active agent together with 2.0 per cent tetrasodium pyrophosphate (based on the weight of goods) should be satisfactory in the above formula in place of the nonionic detergent.

The fabric should be pre-scoured for 20 minutes at 100-120°F. The bath is dropped and the fabric scoured in a fresh bath at 180-200°F. For badly soiled goods the amount of detergent is increased, or one percent to two percent by volume of a solvent such as xylene or Varisol is added. It is most important to rinse out all of the xylene since it has a moderate carrier effect in dyeing. The solvent should be emulsified with a nonionic detergent prior to adding it to the scour bath.

Stains that resist normal scouring can sometimes be removed with stripping agents or bleaching agents. A treatment with 0.1 to 0.2 oz/gal. of oxalic acid is effective in removing iron or rust stains.

Mercerizing and Kier Boiling

It may be desirable to mercerize the cotton in the blend to increase the fabric luster. Normal cotton mercerizing, including the treatment with highly concentrated caustic, is not harmful to "Dacron" polyester fiber as long as the temperatures are kept low. Since caustic soda solutions at high temperatures gradually dissolve "Dacron," kier boiling should be avoided.

Bleaching

Following preparation, the blend can be bleached with "Textone" (9) and nitric acid. In this process, the goods are run for about one hour with two grams per liter of "Textone" and 0.5 grams per liter of 61 per cent nitric acid at 180°F. to 190°F. This treatment gives good bleaching with a minimum degradation of the cotton. Mineral acids, on the other hand, can injure cotton if the concentration is not kept low. Laboratory tests also show that the pitting of type 304 or 316 stainless steel by "Textone" is reduced by nitric acid.

Hydrogen peroxide and sodium metasilicate are suggested where only the cotton is to be bleached and will produce an acceptable white by itself. Optical bleaches and blue tints can be used in the same way as they would be for all cotton fabrics. A small amount of "Latyl" (10) Violet BN may be included if it is desired to tint the "Dacron" also.

Any bleaching procedure should be tested under actual conditions of use before adoption to a commercial scale. Deterioration of the fibers as well as the effectiveness of the bleach should be considered.

(2) Product of Standard Oil Company.

(3) "Energetic" S—product of Armour & Company, Chicago, Ill.
"Sterox" 6—product of Monsanto Chemical Company, Boston, Mass.
"Igepal" CO 630—product of General Dyestuffs Corp., N. Y., N. Y.

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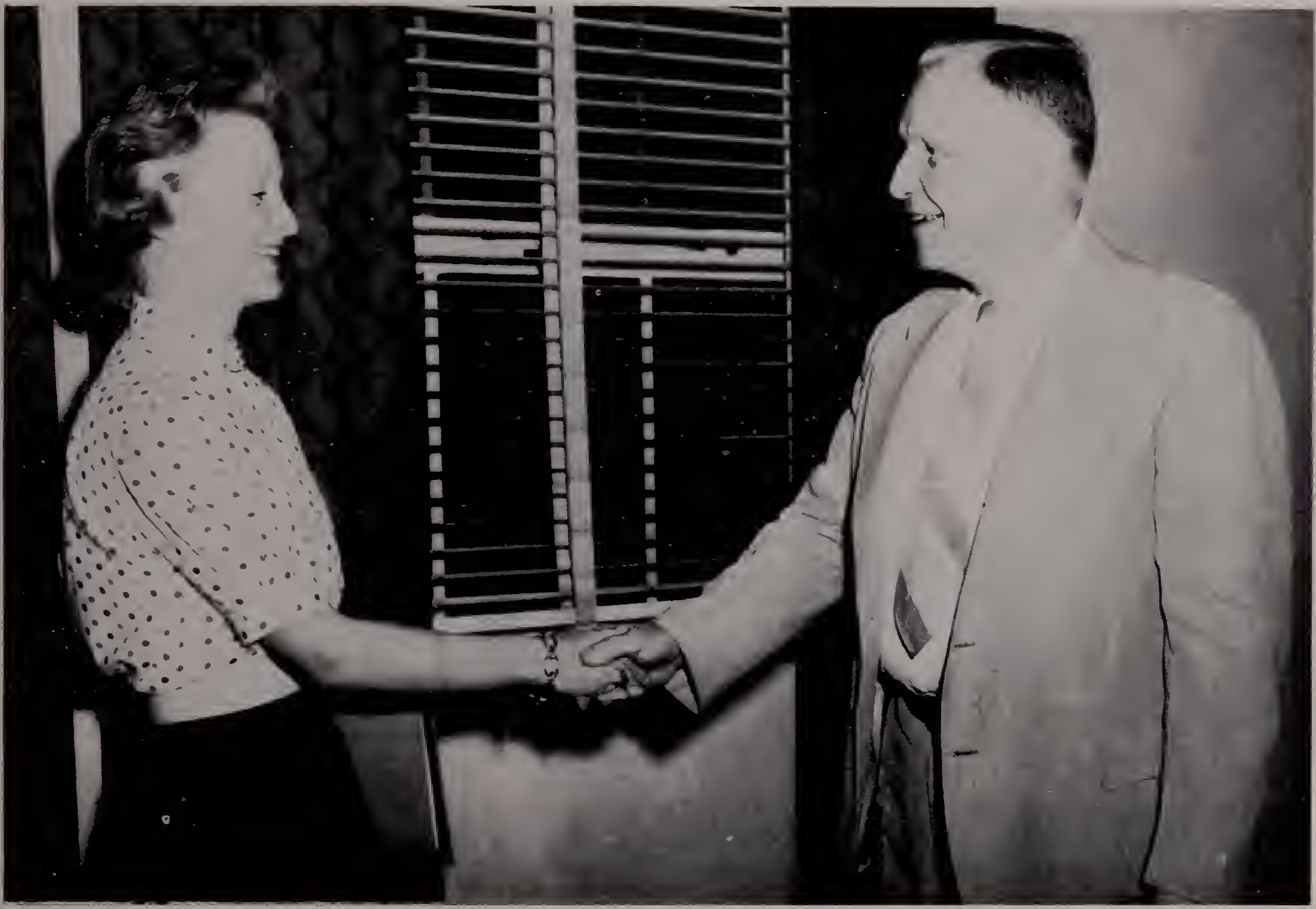

Textile School Gets Coed

By S. J. Reeves, Circulation Manager

During the past year, Clemson has undergone several major changes. Along with the abolishment of the cadet corps there was another change that raised a few eyebrows. Girls were to be admitted to Clemson as regularly enrolled students for the first time. In September of this year, something else happened that was without precedence. A girl enrolled in the Clemson Textile School for the first time. This was a pleasant surprise to all the textile students. Her name is Alma Gamble and she hails from Greeleyville, South Carolina. She has chosen Textile Manufacturing as her major.

Now for a little background. From her high school days come the following facts and accomplishments. She was Miss Greeleyville High of 1955, Treasurer of the Beta Club and a member of the Junior Homemakers of America. From a graduating class of seventeen, she was honored with five of seven superlatives. These included Best Looking, Best-Dressed, Best All-Around, Personality Plus and Most Athletic. Also during her Senior year, she was Art Editor of "The Tiger", the school annual.

Since arriving at Clemson, she has been accepted to sing with the girls ensemble with the Glee Club.

After graduating from Clemson, she wants to become a buyer, either for a retailer or wholesaler. By getting knowledge of textiles through her studies at Clemson, she hopes to know more about what she will be buying and in this respect, make a better buyer.

Alma, THE BOBBIN & BEAKER and the School of Textiles welcomes you cordially. You have the distinction of being the first girl student to brighten the halls and classrooms of Sirrine Hall. Good luck to you during the remainder of your stay at Clemson.

Left to right: Bobby Holmes, Bobby Painter, Tommy Boyce, Joe Tisdale, Ron Childress, Odell Bragg.

Phi Psi News

By R. J. Tisdale, Secretary

Iota Chapter brought to a close a fairly successful year this past June. The fraternity can remember bringing in thirty-two new members and losing, with hope and success for them all, twenty-eight members by graduation.

During the year we had our usual banquets. The spring banquet was held in the Gold Room of the Clemson House. The banquet was a great success and the members benefited from a fine talk of things for young men in textiles to look for in the next few years.

The social activities of Iota Chapter were limited to these two banquets, but it is planned to expand this year.

Near the end of the session, Iota Chapter, without too much deliberation, changed its requirements for eligibility for membership. It was decided to set the requirements on a percentage basis rather than on previous grades. It is believed that the Phi Psi and its members will benefit from the raising of these standards.

At the meeting of May 9, 1955, officers for the year were elected. They are: President—Thomas E. Boyce; Vice-President—Ronald L. Childress; Secretary—Robert J. Tisdale; Treasurer — Bobby A. Painter; Senior Warden—Bobby Holmes; Junior Warden—Odell Bragg. These officers were installed at a special meeting.

Martin Employed as Cotton Utilization Specialist

William J. Martin has been employed by the Federal Extension Service, U. S. Department of Agriculture, to serve as Cotton Utilization Specialist.

Mr. Martin has been with the Agricultural Marketing Service of the USDA doing research on market outlets for cotton in cooperation with cotton manufacturers. Previously he did similar research work with the Cotton Branch of the former Production and Marketing Administration. Prior to coming to Washington, D. C., he was located at the Cotton Ginning Laboratory at Stoneville, Miss., working on cotton fiber testing and cotton ginning problems. He entered the Army November 25, 1940 and was released with the rank of Colonel December 31, 1945.

Mr. Martin is a graduate of the Georgia School of Technology in textile engineering with a major in textile chemistry and dyeing. He also has had a year of post graduate work at Georgia Tech. Before joining the U. S. Department of Agriculture in 1930 he worked with textile manufacturing plants in the Southeast.

During the past two years he has served on two foreign missions in Europe and Asia sponsored by the National Cotton Council and the U. S. Department of Agriculture dealing with textile manufacturing and marketing problems.

The educational program on cotton utilization will deal mainly with problems of the textile industry in the South, New England, and other appropriate sections of the country. Mr. Martin now has his official headquarters with the Federal Extension Service at Clemson College, South Carolina. He is assigned to the General Crops Marketing and Utilization Branch of the Division of Agricultural Economics Programs of the Federal Extension Service and will work closely with the Southern Utilization Research Branch of the Agricultural Research Service at New Orleans in conducting educational programs.

The purpose of this new line of work is to help acquaint the cotton textile industry on a timely basis with the results of new research which contribute to a more effective and expanded utilization of cotton. Such results will come largely from research conducted by the Southern Regional Research Laboratory of the Agriculture Department, the State textile schools, and other cotton improvement agencies. Many research findings of practical value are currently available to the cotton industry and it is expected that the entrance of an Extension Specialist into this area will help materially to disseminate this information as it becomes available.

State and Federal research studies on cotton production, ginning, marketing, and textile processing are all directed toward reduction of cost and improvement of the quality of cotton products. Mr. Martin will work to widen the application of available research information by the users of cotton, which should help improve cotton's competitive position and benefit all phases of the industry from cotton producers through cotton consumers.

The results of cotton utilization research will be disseminated through national and local industry organizations, textile schools, and contacts with individual mills. In order to keep the program on a manageable basis, the initial work will be limited to single new developments bearing on such utilization problems as:

1. Opening and cleaning cotton at the mill.
2. Nep control and increased card production.
3. New tightly woven cotton fabrics to meet special consumer needs.

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Later, results of chemical finishing research will be included under the Extension Service Utilization Program.

The Extension Cotton Utilization Specialist will work cooperatively with research agencies, industry organizations, and State extension services in planning and conducting programs in this field of extension work. An important part of the utilization specialist's function will be to find out the current utilization problems of the cotton industry and present them to the Southern Utilization Research Laboratory and other research and service agencies of the United States Department of Agriculture, the State extension services and others for consideration and further development of research efforts to better meet industry needs.

TEXTILE SCHOOLS AND RESEARCH ABROAD

(continued from page 8)

proximately $500,00 per year which is matched by a Government grant of $250,000. Various spinning and weaving firms contribute smaller amounts. The institution has 290 members on the staff to perform fundamental and technical research. Our group was there on the opening of their new plant costing approximately $280,000. The laboratory was carrying on most excellent research in textile testing, electronics, static problems, infra-red spectroscopy, electron microscopy and making new machine developments for testing and processing. Some of the new electronic devices were yarn patterning predictor, a strainometer, tensiometer, cloth profile recorder, electronic indicator for loom sets, prototype fluid motion beds of air driven sand for drying of textiles and ultra-sonic cleaning for spinnerettes and for oil spots on fabric.

Before closing the tour the group had a conference at the International Wool Secretariat, which operates in fourteen different countries and cooperates with the Wool Bureau in the United States. For promotion of wool the Secretariat has collected more than three million dollars from a bale tax on the wool produced in the cooperating countries. The funds are used to promote continuous, even life time fellowships in Leeds and other universities in England and a certain amount is spent with institutions in the United States.

In view of the new work and expansion seen by the group, there should be tremendous advancement in textiles in most of the European countries and the whole world will indirectly reap much benefit.

Left to right: Henry Addison, George Christian, William Purvis, R. P. Moore.

N. T. M. S. News . . .

An officers meeting of the National Textile Manufacturing Association was held October 4 with Mr. E. A. LaRoche, Faculty Advisor, to discuss and outline the coming year's programs and project.

The N.T.M.S. is proposing this year to equip the Textile School with a much needed directory of professors, their offices, room numbers of the different departments, etc., which was considered to be a very worthy project. To raise funds for such a project, it was suggested that members might sell fancy socks or ties and also this would be a means of advertising our Textile School.

As in the past, we hope to have some outstanding personalities of the textile industry and other industries to participate in our programs, as it is a primary function of N.T.M.S. to give the textile students a little more than can be obtained from textbooks. A showing of this year's football games will be an added feature to the program.

Membership to N.T.M.S., the Clemson Textile School's only professional fraternity is open to all textile students of the upper three classes: Sophomores, Juniors and Seniors. It is hoped that all members and prospective members will take a renewed interest in the N.T.M.S. to make the coming year a most successful one.

SUMMER WORK OCCUPIES VARIOUS MEMBERS OF THE TEXTILE SCHOOL FACULTY

By J. P. Campbell, Managing Editor

Many of us are under the impression that a professor's job is confined to nine months of teaching. This is not the case for most of our textile professors. Many of them find research work in the various fields of industry.

Such was the case of Professor T. A. Campbell, Jr., who spent the summer setting up a cost accounting system in Bogota, Columbia, South America.

Another professor, Dr. W. T. Rainey, Jr., confined his summer activity to working in the Chemistry Section of the Deering-Milliken Research Corporation. He was not at liberty to reveal the exact nature of his work, but he was permitted to disclose that it involved organic synthesis of various types of finishing agents.

Also, Professors LaRoche, Jameson, Tarrant, Richardson and Whitten were doing research work here in the School of Textiles on a project for the E. I. du Pont de Nemours & Co., Inc. Others working here were Profesors Lindsay and Langston for the B. F. Goodrich Company and Professor Breazeale for the Diversay Corporation. The J. E. Sirrine Foundation employed D. P. Thomson and J. H. Marvin on a single and double creel project; Professor J. L. Thompson on a card waste study; and Professor J. C. Hubbard, Jr., producing a nylon tube for artery replacement and surgery. Dr. A. N. J. Heyn was working on an x-ray project.

One of the advantages of summer work for professors is that they have the opportunity to catch up on the latest developments. It is also of value to students as their professors are able to present to them the latest improvements in an ever-changing industry.

AMERICAN VISCOSE EXPANDS COLLEGE PROGRAM

Five more institutions will be included in the College Relations Program of American Viscose Corporation for the academic years 1955-56 than in 1954-55. The new total is thirty-four and reflects Avisco's continued interest in encouraging advanced education for the youth of America.

Nineteen fellowships, given for graduate work, have been established in the fields of chemistry, accounting, chemical engineering, and pulp technology. Nineteen scholarships, awarded primarily to undergraduates entering their junior year, are divided among chemistry, engineering, physics, textiles. accounting, chemical engineering, business administration, textile technology, and mechanical engineering.

American Viscose's college program is designed to encourage the study of science, engineering and business administration. Actual selection of recipients is left to the faculty of each institution and the individuals selected are under no obligation of any kind to the Corporation.

Located in 14 states and Canada, the following institutions have been invited to take part in the program this year: Akron University, Allegheny College, Bucknell University, Carnegie Institute of Technology, Case Institute, Clemson Agricultural College, Cornell University, Duke University, Georgia Institute of Technology, Jefferson Medical College, Lehigh University, Lowell Technological Institute, Massachusetts Institute of Technology, McGill University, Michigan State University, New York State College of Forestry at Syracuse, New York, North Carolina State College, Northwestern University, Ohio State University, Pennsylvania State University, Roanoke College, Swarthmore College, Texas State College for Women, University of Delaware, University of Maine, University of North Carolina, University of Pennsylvania, University of Rochester, Virginia Polytechnic Institute, West Virginia University and Yale University.

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SOUTHERN TEXTILE ASSOCIATION MEETS AT CLEMSON

By Emil Stahl, Editor

The annual meeting of the South Carolina Division of the Southern Textile Association met October 1 at the Clemson House. Approximately three hundred members attended.

Most of the members witnessed a thrilling climax to the day by watching Clemson defeat the University of Georgia, 26-7.

Dr. R. F. Poole welcomed the visitors at the Clemson House and asked them to offer constructive criticism to the School of Textiles at Clemson.

Dr. Hugh M. Brown, Dean of the School of Textiles at Clemson emphasized to the group that the demand for textile graduates at Clemson was at an all-time high.

The various speakers were introduced by Mr. Joe Jenkins, Chairman of the South Carolina Division of the Southern Textile Association, and Superintendent of the Kendall Mill's upper Pelzer plant. Some of the speakers included Mr. Sam S. Rice, representative of the West Point Foundry Machine Co., who spoke on "Air-Dri" slasher; Mr. Donald Marshall, Divisional Manager of the Draper Corporation, who gave a talk on "What to Look Forward to in the Way of Loom Developments"; Superintendent of Joanna Mills, Mr. Joe Delaney, talked on "What the Mills are Doing in the Way of Improvements on Processing and Other Equipment."

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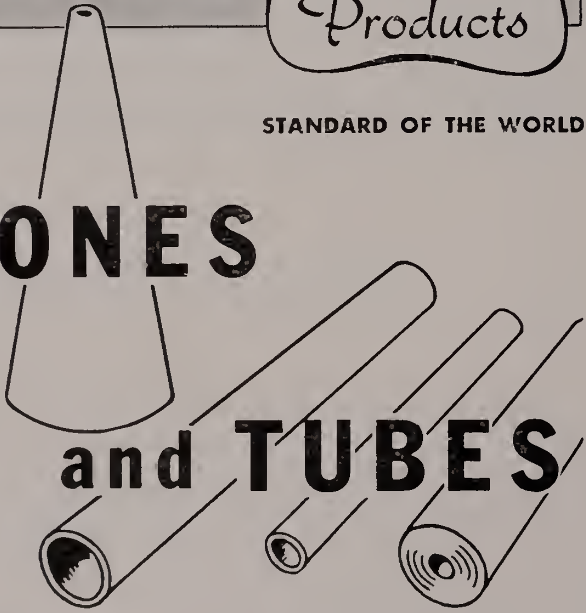

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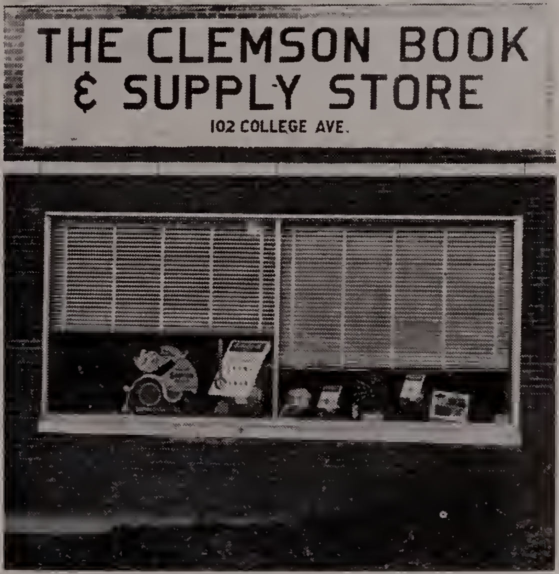

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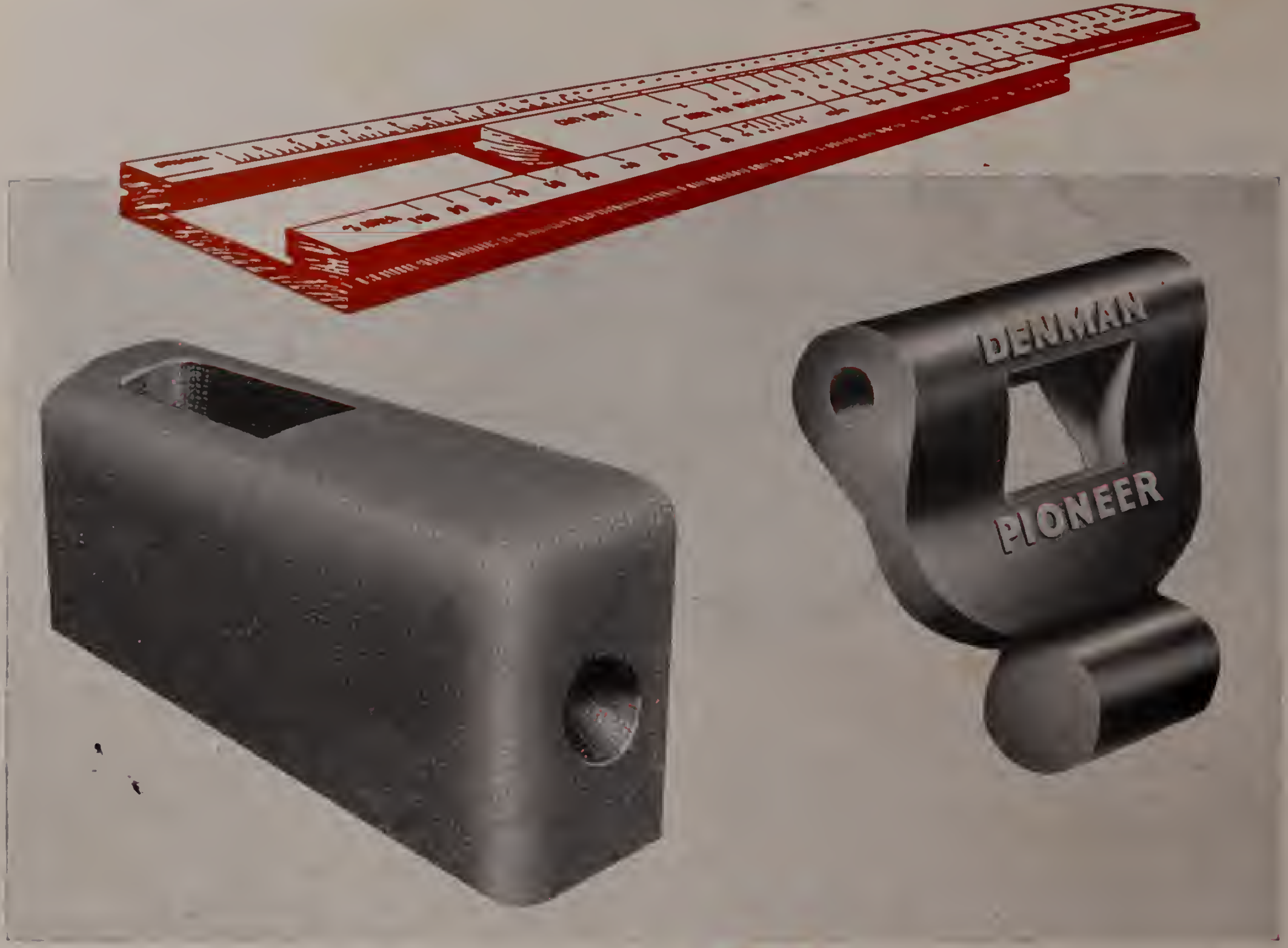

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THE COVER: "Composition of Lines and Textures." This composition was created through the use of cotton roving for the lines, and a broadweave drape for the texture. . . . Ted Pappas '57

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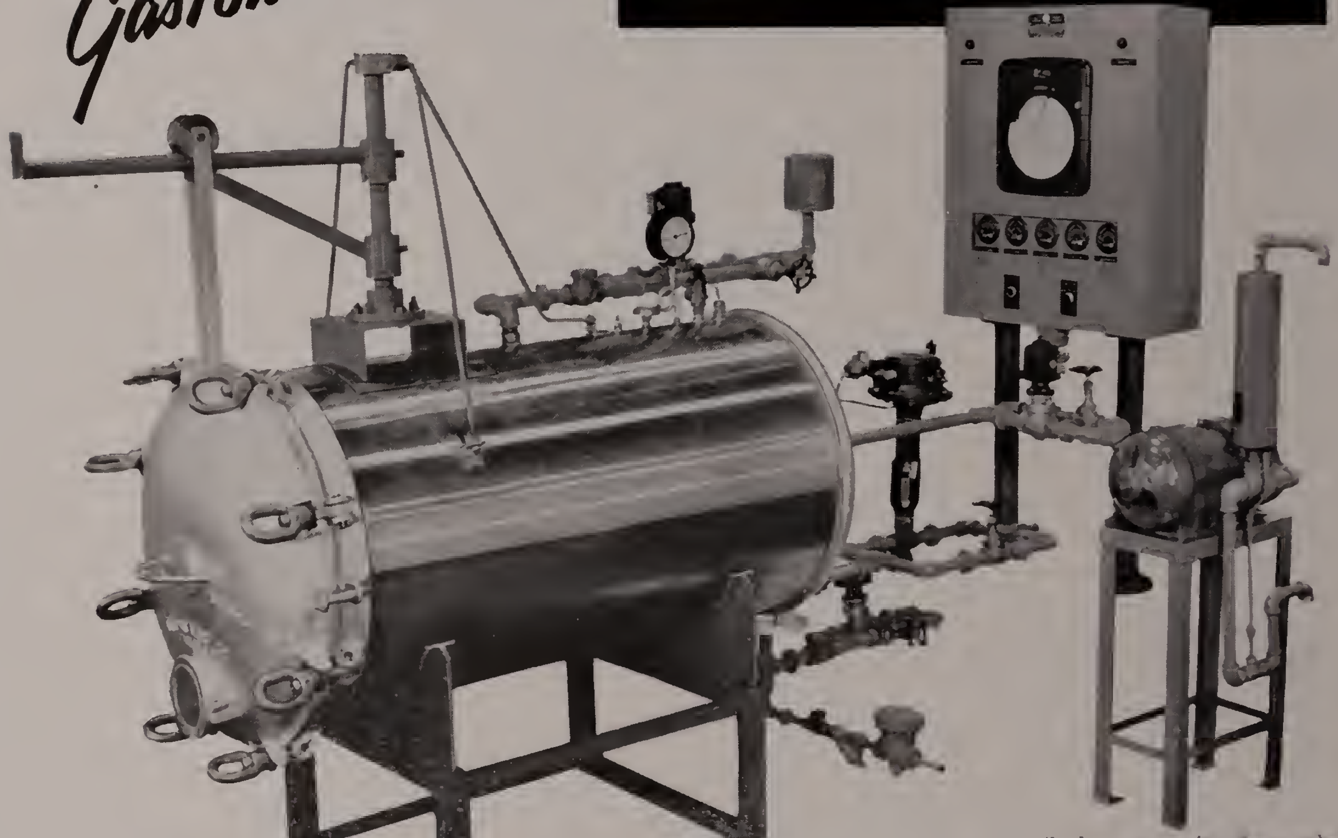

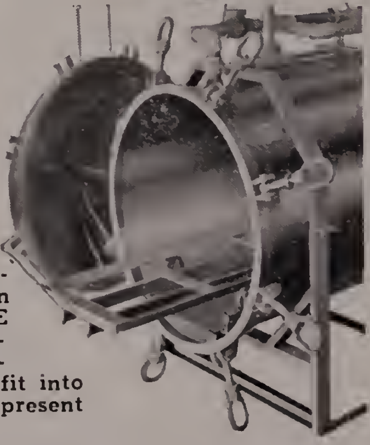

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What The Mill Expects Of A Textile Graduate

H. B. Risher, Plant Manager
Excelsior Finishing Plant
Pendleton, South Carolina

Mr. Roger Milliken, President of Deering, Milliken and Company, Inc., has stated that "I am not interested in hiring a degree—I want the **man.**" In a general, sweeping statement, this summarizes my ideas on what is looked for when hiring a college graduate into the Textile industry. However, in order to define more clearly the goal in looking for a man, it is necessary to look at the question from three sides.

1. What is looked for in the initial interview, while the prospect is still a student?
2. What is expected when the graduate reports "on the job?"
3. What is expected of the man after he completes his training period and assumes supervisory responsibilities?

Let's look first at the first question — WHAT IS LOOKED FOR IN THE INITIAL INTERVIEW? Much can be ascertained from these interviews, and all questioning is directed to a purpose. First, we look for poise in the man—how he talks; does he grope for words, or can he express himself adequately? He may be a brilliant student, but unless he possesses the necessary vocabulary and understanding to express himself clearly and simply, he cannot impart his ideas to his superiors nor to his subordinates. How can this man sell his ideas to his supervisor if he can't express them in such a manner as to have them understood? How can this man explain to one of his employees how to do a job in such manner that the employee clearly understands? Ability to express oneself is as essential and important as technical "know-how" if one is to climb the ladder of success in the Textile industry.

Other traits looked for in the interview are (a) Ability and willingness to learn, as evidenced by scholastic averages. We don't look for, nor do we expect, a genius in our supervisory positions, but we do require that the man have more than average intelligence. In most instances, the student has acquired the foundation and needs the experience. If he has proved that he has the ability to learn, we feel that we can help him learn the additional "know-how" needed. (b) A basic knowledge of business. Supervisors are charged with the responsibility of running a department. This involves the proper utilization of materials, machines, and manpower most effectively. A supervisor is, in actuality, running a "business within a business." It is imperative, therefore, that he have some knowledge of how business operates. If an individual has acquired this basic knowledge while a student, he can more clearly understand the operations of a department and of a mill. (c) Indications of leadership in an individual, as indicated by his participation in extracurricular school activities, such as fraternities, campus organizations. Does he hold, or has he ever held, office in such organizations? Did he participate in athletics? Was he a member of the band, glee club, etc.? Is he a campus leader? The supervisor of today must be a leader. He is charged with directing the activities of people—perhaps only one person, or maybe hundreds of people. It is therefore necessary that he be able to get along well with people and be able to lead them in the direction indicated by management. (d) Initiative. We look for an individual who looks for better ways of doing things—who is dynamic, not static.

In the initial interview, many things are noticed which, when grouped together, tend to give a complete picture of the individual. In addition to the things which have already been discussed, the general appearance of an individual is important. If the importance of this first interview can be impressed upon the readers of this article, the purpose in this writing will have been accomplished. Remember: **You are attempting to make the most important sale of your life at that moment—you are selling yourself and your services to a plant or an organization.** It is imperative that you present your **best** self. But a word of caution: Do not attempt to "confound with wisdom" an executive who is interviewing you. Be relaxed, have some intelligent questions to ask, and answer honestly and to the best of your knowledge and ability any questions asked of you.

Now let's take a look at the second question — WHAT IS EXPECTED OF THE GRADUATE WHEN HE REPORTS "ON THE JOB?" Most mills today have a formalized training program for college graduates. This program usually covers all phases of mill operation, and if a person is to absorb properly the training offered, he must possess the ability to learn. Training generally is not of such an intensified nature as to "throw" the material at the trainee. On the contrary, it is a gradual learning process on the part of the trainee. However, it is of such a nature that it is absolutely imperative that the individual apply himself **wholly** to the training program. It requires effort on his part, some original thought, if you please. We do not want automatons; we want men who think, who apply themselves, and who are willing to make sacrifices to succeed. We want men who are positive thinkers. We expect trainees to make an effort to continue improving their thinking and reading. Outside study is encouraged in all phases of the business. It is preferable that the trainee live in the immediate community and participate in community activities, e.g., church, civic clubs. We feel that in order to become an integral part of the business, he must beome a part of the community.

The trainee is expected to demonstrate initiative while working. From the first day he reports to work, each new man is encouraged to look for means of improving on an operation. Criticism from the trainee is invited.

When a trainee reports for work, he has already sold himself. Now it's up to him to justify this decision. He is guaranteed the opportunity to learn—nothing more. It is up to the trainee to "carry the ball."

Finally, let's take a look at the third question which was posed at the beginning of this article: WHAT IS EXPECTED OF THE MAN AFTER HE COMPLETES HIS TRAINING PERIOD AND ASSUMES SUPERVISORY RESPONSIBILITIES? In most cases, prior to "taking over" a supervisory job, an individual has spent many months on a training program, preparing for just this day. He is presumably "ready." He is immediately faced with problems—personal problems, machine maintenance, operation problems, waste, maintaining the proper flow of goods, to mention only a very few. He is expected to handle these problems. Help is available to him in the form of staff personnel (Personnel Department, Industrial Engineering, Maintenance Department), technical publications, and many others.

Probably the first thing which will strike the new supervisor is the fact that he no longer has a job which he runs from eight a.m. to four p.m. Rather, he will find that there are not enough hours to get all the work done. The point I'm trying to stress is this: The supervisor is being paid to manage a department. Much of his managing will be done after his employees leave for the day (organizing and planning the work, for example). He is expected to put in as many hours as will be necessary to run the job. Often he will find it necessary to pass up the party, the week-end football trip, or that fishing trip he had planned. Now, I don't mean to imply that after you become a supervisor your routine will be "all work and no play." To the contrary, there will be play, the type of play which comes with personal economic improvement. If a man has chosen his field of endeavor wisely, his work, in large measure, will be play. It must of necessity be so.

Have you ever noticed that leaders in business and profession are usually the men who are civic leaders also? This is no coincidence. These people have proved their ability to organize and manage, and communities, towns, and cities are like business in that they are seeking to improve. Is it not natural, then, that the man who has proved his ability be called on to direct the civic activities? Normally an organization is quite happy when one of its men is chosen to direct some civic project or club. This speaks well for the man and for the company too. This man is a live medium of public relations. His every action is a reflection, either directly or indirectly, on himself, his family, community, and job.

An organization expects a man to continue to improve himself from the standpoint of learning everything he can about his particular job, through reading of trade publications, conferences, and visits to other plants and industries.

Supervisors are expected to live up to the trust which has been given them—that of leading a group of people, of running the job in a conscientious, fair, safe manner. Conduct unbecoming a leader of our employees will not be condoned.

The mill expects of Textile graduates the same that was expected ten or twenty years ago—men who are ambitious to succeed, who are diligent workers, who are willing to learn, and who, when the opportunity presents itself, will "take the bull by the horns" and go.

WASH-and-WEAR The New Bonanza in Cottons

By Dr. Edward A. Murray
Research Consultant, School of Textiles
Clemson, South Carolina

The ten years since the close of World War II have witnessed a remarkable transition in the finishing of cotton apparel fabrics, particularly those used for dresses and children's clothing. Once a work-horse fiber used mainly for inexpensive garments, some cotton textiles are now bringing premium prices and the market can't seem to get enough. While due in no small measure to well-aimed sales promotion campaigns, perhaps an even more significant reason for this new popularity has been the development of synthetic finishes for cotton which permit laundering with little or no ironing — the so-called "wash-and-wear" finishes.

What is a wash-and-wear finish? Basically it is a crush-resistant resin treatment. Such finishes have been applied to rayon fabrics for a long time; without them rayon would not have been able to achieve its present popularity as a low-cost summer suiting fabric. More recently, crush-resistant cottons have also become available under such trade names as "Wrinkle-Shed" and "Disciplined".

Crush resistant and wash-and-wear finishes are both based on the same type of resin treatment. The big difference is in the concentration of applied resin. Where crush-resistant treatments usually employ from 4 to 6 per cent resin on the weight of the fabric, wash-and-wear finishes require 10 to 15 per cent or even more. With such high concentrations of resin, most of the wrinkles usually found in laundered cotton articles are no longer present after drying. For best results, certain precautions should be observed in laundering; one of the most important is to avoid introducing hard creases by wringing or spin drying. It is best to let the excess water drain off of its own accord or to squeeze only very gently before hanging the garment up to dry.

The resins used in producing the new finishes are of two types—urea and melamine. Both are "thermo--setting." As supplied to the finishing plant, they are water-soluble and chemically reactive; after application to the cloth, they undergo a curing process which changes them to a permanently insoluble form within the fiber. During application, the resin molecules are small and diffuse readily into the fibers. After curing, they are much larger and the resin has become an integral part of the finished textile. This presence of resin inside the fiber considerably alters its physical properties; swelling in water is markedly reduced, stiffness is increased, and the fiber is somewhat more brittle. Because of the stiffening which accompanies curing, it is important to remove as much of the surface resin solution as possible from the cloth after impregnation. Otherwise, the final product will be extremely stiff. However desirable this attribute may be in reinforced concrete and roofing tiles, a little goes a long way in dress fabrics.

One of the major problems attending the development of satisfactory urea resins for cotton finishing has been the elimination of fiber embrittlement. The cheap urea resins used for rayon treatment are entirely unsuitable, and it has been necessary to develop entirely new, and much costlier, resins for cotton—the so-called "cylic" ureas, of which there are now several on the market. That the present products have successfully reduced fiber embrittlement is attested by the tank car quantities being sold, and the difficulties most finishers are having in keeping up with the burgeoning demand for wash-and-wear cottons.

Application of the finishes is relatively simple, although careful control is always necessary. The fabric, following the usual finishing treatments such as singeing, desizing, bleaching and dyeing (or printing) is padded through a resin solution of the appropriate concentration. Generally the bath also contains a variety of modifying agents, such as softeners and emulsified thermoplastic resins to give the desired hand to the finished textile. An acid catalyst, usually in the amount of about 5 to 20 per cent based on the resin solids in the bath, is added just before the padding operation. Following impregnation, the fabric is given a tight squeeze to remove as much of the surface solution as possible, and dried. The fabric then passes through a curing oven where temperatures are considerably higher than in the drying section, usually in the range of 300-600° F. The time of exposure necessary to effect proper curing varies from a few seconds at the higher temperatures to several minutes at the lower ones; speed of travel through the curing oven is regulated so as to produce a high degree of permanence in the finish with as little tendering as possible. Following curing, the fabric is ordinarily scoured to remove traces of uncured surface resin and residual catalyst. It is then ready for a final drying and such dry finishing operations, e.g., calendering, as may be necessary.

Entirely apart from their wrinkle recovery features, thermosetting resin treatments have some secondary effects on the finished cloth. Initial laundering shrinkage is markedly reduced, and it is rarely necessary to Sanforize these materials. This is of some importance to the finisher; there is a saving in yardage of from about 3 to 6 per cent which would be lost in the compressive shrinking operation.

Not all of the alterations in fabric properties produced by the resin finishes are desirable ones, however. The treatment is accompanied by substantial losses in tensile and tear strength, as large as 50 per cent of the values for untreated fabrics. Always objectionable, strength reductions of this order of magnitude are prohibitively great in light weight fabrics, and preclude production of sheer materials with wash-and-wear finishes. A new resin which would lessen these strength losses would find a ready market.

Another undesirable aspect of wash-and-wear finishes is their tendency to retain chlorine. If hypochlorite bleaches are used in the laundering of fabrics finished with thermosetting resins, their useful life is greatly reduced. The resin, probably because of its nitrogenous character, absorbs active chlorine readily, and the fabric becomes tender very rapidly thereafter. This absorption of chlorine is also accompanied by yellowing which is particularly undesirable in fancy fabrics containing a high proportion of white or pastel colors, and the yellowing is greatly aggravated by ironing.

Resin manufacturers recognize these deficiencies, and are constantly working to improve the products used in resin finishing of cottons. One resin with substantially reduced chlorine retention is on the market, and it is generally believed that the problems of strength loss and chlorine retention will ultimately be overcome.

Perhaps the greatest shortcoming of all in the wash-and-wear finishes is that few of them, in flat-woven fabrics at least, live up to their name. Attractive as the complete emancipation from the ironing board may be, not many housewives have the courage to drip-dry their frocks and wear them fresh from the clothesline. While a drip-dried dress may not have a slept-in appearance, most of them don't look freshly ironed, either. A laboratory swatch of fabric may drip-dry with no trace of wrinkles, but the tailored garment is quite likely to be another story. If American women wore saris, everything would probably be just dandy, because the problems seem to occur only where sewing is involved; "bubbly" or puckered seams are one of the biggest headaches in present wash-and-wear garments. "Wash-and-iron lightly" is perhaps a more descriptive name than "wash-and-wear" for most of the resin finished cottons available today.

Whatever their shortcomings, however, these new thermosetting finishes for cotton are attracting a lot of attention in the market place, and a lot of dollars as well. Their prodigious growth over the past two or three years makes one wonder whether the next step won't be a fabric that doesn't need washing.

Woolen Industry Comes South

By Edwin Wilkinson
Executive Vice President
National Association of Wool Manufacturers

With the recent establishment of two wool combing plants in South Carolina, an integrated woolen and worsted industry is developing in the South.

Since the end of World War II the South has made great strides in wool manufacturing but lacked plants for preliminary processing of wool until the combing plants were set up. Previously virtually all wool tops, from which worsted yarn is spun, were shipped in from Northern combing plants, principally in New England.

The South's greatest gain in wool manufacturing machinery has been in worsted spindles and as this growth continued it seemed certain that combing plants would be established, as they have been, to serve the worsted spinning and weaving mills.

The American system of worsted spinning, developed from the cotton system, had its beginnings in the South and today American-spun yarns are competing substantially with the traditional French system and Bradford system yarns. Much of the worsted yarn made for sale goes to the knitting trade since very few knitters operate any spindles.

Another important development resulting from increased processing of wool is the greater importance of Southern cities as ports of entry for imported wools. Though the principal ports of entry continue to be Boston, New York and Philadelphia, Southern cities are on their way to becoming important to the wool trade.

This development was highlighted in November when Charleston, S. C., sponsored its first Wool Week as a means of pointing up its growth as a port of entry for wool. In the first year wool was handled, more than 45,000 bales, valued at about $16 million, came in through Charleston.

Charleston's first wool cargo arrived from South Africa in April of 1954 and since then shipments have come from major wool growing nations the world over, including Argentina, New Zealand and Australia as well as South Africa.

The importance of wool to a port can be readily understood when it is realized that domestic growers normally supply less than half of the apparel wool consumed in the United States and virtually none of the carpet wool.

On a national basis the wool textile industry has been shrinking in size since the end of World War II but, at the same time, the industry has been growing in the South and that growth seems destined to continue.

Today there are close to 100 wool textile plants in eight southern states: North Carolina, South Carolina, Georgia, Virginia, Tennessee, Alabama and West Virginia. It is estimated they account for about 20 per cent of all the woolen and worsted looms in place in the United States, about 22 per cent of the worsted spinning spindles and around 12 per cent of the woolen spinning spindles. By comparison, at the end of 1949, the South had 12 per cent of the looms, 5 per cent of the worsted spindles and about the same number of woolen spindles.

The older wool manufacturing areas, New England and the Middle Atlantic States (New York, New Jersey and Pennsylvania) have suffered mill liquidations. It is estimated, however, that more than half of the nation's wool manufacturing machinery still is located in New England.

The over-all decline in wool manufacturing in the United States is a cause for concern. Looms in place have dropped from 35,444 in 1949 to 26,878 at the beginning of this year. In the same period worsted spinning declined from 1,844,000 to an estimated 1,000,000 and woolen spinning spindles from 1,443,000 to an estimated 900,000.

A great many reasons are cited for this decline, which has taken place in the face of generally good business conditions and a growing population. Among the reasons mentioned is the trend to a lighter-weight and more informal clothing.

Still another reason may be the tendency of wool to price itself out of the market as compared with other fibers, particularly the new man-made fibers. As noted earlier, domestic growers normally produce less than half of the apparel wool consumed in this country. Thus wool is one of the few deficit agricultural commodities in this country.

Yet in spite of this fact there still is a duty of 25½ cents per pound on imported apparel wool. Obviously this is a handicap in the highly competitive textile field with mills striving to buy raw materials at the lowest possible levels.

The National Association of Wool Manufacturers believes the duty on foreign wool should be abandoned in view of the fact that domestic wool growers cannot meet our needs.

The Association, however, does favor Government aid to wool growers to the extent that wool is considered a strategic commodity needed for national defense. The Wool Act of 1954, supported by the industry, declared wool to be a strategic commodity and through incentive payments to growers seeks to increase production to about 300 million pounds a year from the present level of about 230 million pounds.

As has been pointed out many times, woolen and worsted mills can, and do, process both natural and man-made fibers and today they are consuming increasing amounts of the man-made fibers. It should be noted here that blends of wool and the new man-made fibers to a considerable degree were developed in the South though mills in all areas now are blending wool with other fibers. Wool continues, however, as the most important fiber in woolen and worsted mills.

Those interests which seek to continue, or increase, the duty on imported wool should bear in mind that a mill is not wedded to any particular fiber and that the mill will manufacture only that fiber, or combination of fibers which result in a product demanded by consumers and which can be made at a fair profit.

The spreading use of the new man-made fibers has not been confined to woolen and worsted mills alone. The entire textile industry has been and still is undergoing a revolution both as to fibers and machinery. Today we find the traditional lines of demarcation in the textile industry — cotton, wool, rayon, silk — are becoming blurred. In development are mills able to process any fiber or combination of fibers.

In common with other segments of the textile industry in the South and elsewhere, woolen and worsted manufacturers are concerned by ever increasing imports of textiles from low-wage nations. It should be remembered that in the same years during which the wool textile industry was declining, imports were rising. The imports are not the sole reason for the decline but certainly they are one of the contributing factors.

A 30-year record high for wool cloth imports was set in 1952 and surpassed in 1953. In 1954, as a result of poor market conditions here, cloth imports dropped but so did domestic production.

This year, however, is another story with imports appearing headed for an all-time record. Of particular concern has been the rapid rate of increase of both wool cloth and yarn imports from Japan which also is menacing the cotton textile industry.

The difficulty of competing with Japan, in particular, and other foreign nations as well, without an equalizing tariff of some type of import restriction can be readily understood when wage rates are cited.

In the United States, the average hourly wage of wool mill production workers is about $1.50. This compares with about 14 cents in Japan, 45 cents in England and France and 30 cents in Italy. United States tariffs on wool cloth have been cut 50 per cent or more from the rates in the 1930 Tariff Act. The duty on wool yarn has been reduced 57 to 70 per cent. The present tariffs fall far short of equalizing the vast gap in wages. Such higher production rates as may exist here cannot offset the wage differential either. The fact is that textile machinery is pretty much the same the world over and many of the mills of competing nations have been modernized with American gifts or loans.

Aside from the fact that imports displace both American mills and workers, there also is the national defense aspect. Wool textiles and textiles of virtually all kinds, for that matter, are military necessities as important as guns, planes, ships and bombs.

In view of the decline which has taken place in wool textiles there is room for doubting the ability of the industry to meet military mobilization needs. The directors of the Association view the situation so seriously they have formally brought their concern to the attention of the Quartermaster Association which serves as a liaison agency between the Government contractors.

It is understood that a military agency now is making a mobilization survey of the industry which is to be completed by the end of the year.

In the industry's view it does not make sense for the Government to permit increasing imports of wool textiles thereby weakening our defense base to say nothing of the damage inflicted on domestic mills and their employees.

In the words of the Association president, Harold J. Walter of Bachman Uxbridge Worsted Corp., which operates both Southern and Northern mills:

"We are asking that the foreign trade policy of the United States be such that the industry can work out its own problems without the overhanging threat of ever-increasing wool textile imports from low-wage foreign countries."

Ten Points To Success

By J. L. Thompson, Assistant Professor
Yarn Manufacturing Department

Frequently, a student has the misconception that to become a supervisor in one of our current-day industrial plants, all that is required is a diploma from an appropriate school signifying that he has successfully completed the required number of courses in his chosen field. It is true that a supervisor of today does need an adequate amount of technical training. In fact, **too many of us learn too little!** It is also true that we need more and more training in subjects other than the technical fields. Today's employee is a human being and he is demanding that he be treated as such. Today's supervisor is also a human being and he must be schooled in the ways of human relations. Experience is still the best teacher and a person must stub his toe several times before he learns to lift his foot. A first year graduate certainly does not have the experience, but with a determination to benefit from his mistakes; with a little trimming here and a little rounding out there, he could become a successful supervisor. Jean Richter once said, "Men, like bullets, go farthest when they are smoothest".

It is hoped that through experience and through association with those persons who possess these qualities that the graduate will eventually attain the ten characteristics listed below. These ten points are by no means all that is needed to become a successful supervisor; but they, in the opinion of the writer, will give the person the necessary foundation to which the finishing touches can be added as the years of toil, sweat, and success make this foundation ever more solid.

1. **TACTFULLNESS.** Tact is much more effective than force. Harsh words only arouse opposition. There is still plenty of truth in the adage, "You can lead a horse to water, but you cannot make him drink."

2. **FAIRNESS.** Each employee deserves the right to be heard. His grievance might possibly be the answer to a multitude of your unsolved problems.

3. **PATIENCE.** Haste still makes waste. Listen to all the facts, weigh them patiently, then make your decision.

4. **FIRMNESS.** Once the proper decision is made and a definite policy is decided upon, put the policy into force and see to it that **all** persons contribute to the effort of making it work.

5. **FRANKNESS.** Say what you mean; however, do not overlook the fact that frankness without tactfulness can sometimes lead to conflict.

6. **LOYALTY.** Loyalty from both employee and employer is essential to the successful operation of any business. The worst of all, however, is the supervisor who undermines loyal words with disloyal deeds.

7. **ALERTNESS.** Never let the employee be the one to inform you of the goings on in your department. Use your ears for listening.

8. **PUNCTUALITY.** You expect your employees to be on time, so practice what you preach.

9. **APPEARANCE.** An unattractive personal appearance covers one's ability with doubt. Soup spots on your tie will probably result in red figures on your budget.

10. **SMILE.** It costs nothing but effort; its returns are bountiful.

Illustration By John Tenniel, From "Through The Looking-Glass," By Lewis Carroll

A WALRUS, A CARPENTER AND THE ENGINEER

"THE TIME HAS COME," THE WALRUS SAID, "TO TALK OF MANY THINGS..."

Timely truths often hide behind the guise of whimsy. Lewis Carroll's walrus and his carpenter accomplice had good reason to talk of many inconsequential things . . . as their audience of oysters was to learn, alas, too late. We have equally good reasons to quote their opening argument.

We agree with the walrus. As engineers we believe the time has indeed come to talk to business men of many things . . . not of shoes, or ships, or sealing-wax, or cabbages, or kings—but of the engineer and his position in your business program . . . of engineering services, of costs, of time—and profits.

This will be our objective in the forthcoming series of messages—to state clearly the function of professional engineering in your business, at a time when the services of a responsible engineering organization are more than ever vital to business success.

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Formulas For Practical Use

The following formulas are published in hope that they will provide an easily accessible reference for the textile student. They were obtained from the 1955-56 Fact File issue of TEXTILE WORLD and are reproduced with the permission of TEXTILE WORLD.

PICKERS

Breaker

$$\text{draft} = \frac{\text{surface speed of delivery (front calender) roll}}{\text{surface speed of feed roll}}$$

$$\frac{\text{rpm. of calender roll}}{\text{rpm. of feed roll}} = \frac{\text{S.S. of calender roll} \times \text{dia. of feed roll}}{\text{S.S. of feed roll} \times \text{dia. of calender roll}}$$

$$\text{S.S. of roll} = \text{rpm.} \times \text{circumference}$$

$$\text{draft} = \frac{\text{product of all driver-gear teeth} \times \text{dia. of calender roll}}{\text{product of all driven-gear teeth} \times \text{dia. of feed roll}}$$

$$\frac{\text{rpm. calender roll}}{\text{rpm. beater}} = \frac{\text{dia. feed pulley} \times \text{driver gears}}{\text{dia. clutch pulley} \times \text{driven gears}}$$

$$\text{rpm. calender roll} = \frac{\text{dia. feed pulley} \times \text{driver gears} \times \text{rpm. beater}}{\text{dia. clutch pulley} \times \text{driven gears}}$$

$$\frac{\text{S.S. of calender roll}}{\text{cir. of calender roll}} = \frac{\text{dia. feed pulley} \times \text{driver gears} \times \text{rpm. beater}}{\text{dia. clutch pulley} \times \text{driven gears}}$$

$$\begin{array}{c}\text{S.S. of calender roll}\\ \text{(or inches of lap per min.)}\end{array} = \frac{\begin{array}{c}\text{dia. feed pulley} \times \text{driver gears} \times \text{rpm. beater}\\ \times \text{cir. calender roll}\end{array}}{\text{dia. clutch pulley} \times \text{driven gears}}$$

$$\text{inches of lap in 8 hrs. (100\%)} = \text{S.S. of calender roll} \times (8 \times 60)$$

$$\text{yds. of lap in 8 hrs.} = \frac{\text{S.S. calender roll} \times 480}{36}$$

$$\text{lbs. of lap in 8 hrs.} = \frac{\text{oz. lap} \times \text{yds. of lap in 8 hrs.}}{16}$$

$$\text{production constant} = \frac{\text{production}}{\text{oz. lap} \times \text{dia. feed pulley} \times \text{rpm. beater}}$$

$$\text{production} = \text{constant} \times \text{oz. lap} \times \text{dia. feed pulley} \times \text{rpm. beater}$$

$$\text{dia. feed pulley} = \frac{\text{production}}{\text{constant} \times \text{oz. lap} \times \text{rpm. beater}}$$

Finisher

$$\text{draft} = \frac{\text{driver gears} \times \text{dia. front calender roll} \times \text{dia. driver cone}}{\text{driven gears} \times \text{dia. feed roll} \times \text{dia. driven cone}}$$

$$\frac{\text{driven draft gear}}{\text{driver draft (cone) gear}} = \frac{\begin{array}{c}\text{driven gears} \times \text{dia. calender roll}\\ \times \text{dia. driver cone}\end{array}}{\begin{array}{c}\text{driver gears} \times \text{draft} \times \text{dia. feed roll}\\ \times \text{dia. driven cone}\end{array}}$$

$$\text{draft} = \text{draft constant} \times \frac{\text{driven draft gear}}{\text{driver draft gear}}$$

To calculate a change of draft:

$$\frac{\text{driver draft gear needed}}{\text{driven draft gear needed}} = \frac{\text{present driver}}{\text{present driven}} \times \frac{\text{present draft}}{\text{needed draft}}$$

$$\frac{\text{driver draft gear needed}}{\text{driven draft gear needed}} = \frac{\text{present driver}}{\text{present driven}} \times \frac{\text{present oz. lap delivered}}{\text{needed oz. lap}}$$

$$\frac{\text{driver draft gear}}{\text{driven draft gear}} = \frac{\text{draft constant} \times \text{oz. lap delivered}}{\text{doublings} \times \text{oz. lap fed}}$$

$$\text{beats per inch} = \frac{\text{blades in beater} \times \text{rpm. beater}}{3.1416 \times \text{dia. feed roll} \times \text{rpm. feed roll}}$$

$$\text{feed-pulley dia. needed} = \frac{\text{present beats per in.} \times \text{dia. present feed pulley}}{\text{needed beats per in.}}$$

$$\text{rpm. of beater} = \frac{3.1416 \times \text{dia. feed roll} \times \text{rpm. feed roll} \times \text{beats per in.}}{\text{blades in beater}}$$

CARDS

Draft

$$\text{draft} = \frac{\text{product of driver gears} \times \text{dia. coiler calender roll}}{\text{product of driven gears} \times \text{dia. lap roll}}$$

$$\text{draft constant} = \text{draft} \times \text{draft change gear}$$
$$\text{draft change gear} = \text{draft constant} + \text{draft}$$
$$\text{draft} = \text{draft constant} \div \text{draft change gear}$$

To calculate a change of draft:

If the same oz. lap is to be used:

$$\text{draft gear needed} = \frac{\text{present draft gear} \times \text{present draft}}{\text{needed draft}}$$

$$\text{draft gear needed} = \frac{\text{present draft gear} \times \text{gr. sliver needed}}{\text{present gr. sliver}}$$

If the oz. lap is to be changed:

$$\text{draft gear} = \frac{\text{draft constant} \times \text{gr. sliver}}{437.5 \times \text{oz. lap}}$$

$$\text{draft gear needed} = \frac{\text{present draft gear} \times \text{present oz. lap} \times \text{gr. sliver needed}}{\text{oz. lap to be used} \times \text{present gr. sliver}}$$

Production

$$\text{rpm. doffer} = \frac{\begin{array}{c}\text{driver gears} \times \text{dia. driver cylinder pulley}\\ \times \text{dia. small lickerin pulley} \times \text{rpm. cylinder}\end{array}}{\begin{array}{c}\text{driven gears} \times \text{dia. lickerin drive pulley}\\ \times \text{dia. doffer production pulley}\end{array}}$$

$$\begin{array}{c}\text{production gear needed}\\ \text{(doffer change gear)}\end{array} = \frac{\begin{array}{c}\text{present gear} \times \text{present gr. sliver}\\ \times \text{production needed}\end{array}}{\text{gr. sliver needed} \times \text{present production}}$$

$$\text{production constant} = \frac{\text{production}}{\text{gr. sliver} \times \text{rpm. doffer}}$$

$$\text{production} = \text{production constant} \times \text{gr. sliver} \times \text{rpm. doffer}$$

DRAWING FRAME

Draft

$$\text{draft} = \text{draft constant} \div \text{draft gear}$$

To calculate a change of draft:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present draft}}{\text{needed draft}}$$

If gr. sliver fed and gr. sliver delivered are both changed:

$$\text{draft gear needed} = \frac{\begin{array}{c}\text{present gear} \times \text{present gr. sliver fed}\\ \times \text{gr. sliver to be delivered}\end{array}}{\text{present gr. sliver delivered} \times \text{gr. sliver to be fed}}$$

If gr. sliver fed remains the same and gr. sliver delivered is changed:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{gr. sliver to be delivered}}{\text{present gr. sliver delivered}}$$

If gr. sliver fed is changed and gr. sliver delivered remains the same:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present sliver fed}}{\text{gr. sliver to be fed}}$$

Production

$$\text{production constant} = \frac{\text{production}}{\text{gr. sliver delivered} \times \text{rpm. front roll}}$$

$$\text{production} = \text{production constant} \times \text{gr. sliver} \times \text{rpm. front roll}$$

$$\text{production in 8 hrs} = \frac{\begin{array}{c}480 \times \text{rpm. front roll} \times \text{cir. front roll}\\ \times \text{gr. sliver} \times \text{deliveries}\end{array}}{36 \times 7{,}000}$$

ROVING FRAME

Draft

Slubber

$$\text{draft} = \frac{12 \times \text{gr. sliver fed} \times \text{hank roving delivered}}{100}$$

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present draft}}{\text{draft needed}}$$

If gr. sliver and hank roving are changed:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present HR} \times \text{present gr. sliver}}{\text{HR needed} \times \text{gr. sliver needed}}$$

If gr. sliver remains the same but hank roving is changed:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present HR}}{\text{HR needed}}$$

If gr. sliver is changed but hank roving remains the same:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present gr. sliver}}{\text{gr. sliver needed}}$$

Twist

tpi. = rpm. of flyer ÷ (rpm. front roll × cir. front roll)
twist constant = twist gear × tpi.
twist gear = twist constant ÷ tpi.
tpi. = twist constant ÷ twist gear

To change tpi.:

$$\text{twist gear needed} = \frac{\text{present gear} \times \text{present tpi.}}{\text{tpi. needed}}$$

If hank roving is changed:

$$\text{twist gear needed} = \frac{\text{present gear} \times \sqrt{\text{present HR}}}{\sqrt{\text{HR needed}}}$$

Lay

lay constant = lays per inch × lay gear
lay gear = lay constant ÷ lays per inch

If lays per inch are to be changed:

$$\text{lay gear needed} = \frac{\text{present gear} \times \text{present lays per inch}}{\text{lays per inch needed}}$$

If hank roving is to be changed but the twist multiplier remains the same:

$$\text{lay gear needed} = \frac{\text{present gear} \times \sqrt{\text{present HR}}}{\sqrt{\text{HR needed}}}$$

Tension

$$\text{tension gear needed} = \frac{\text{present gear} \times \sqrt{\text{present HR}}}{\sqrt{\text{HR needed}}}$$

Running time

(minutes bobbin in creel will last)
minutes = inches of roving on bobbin ÷ surface speed of back roll

Production

$$\text{minutes per doff} = \frac{3 \times 105 \times \text{HR} \times \text{oz. on full bobbin}}{0.5236 \times \text{rpm. front roll} \times \text{dia. front roll}}$$

$$\text{doffs in 8 hrs.} = \frac{480}{\text{mins. per doff} + \text{mins. for doffing}}$$

lbs. in 8 hrs. = doffs in 8 hrs. × lbs. per doff

ROVING AND YARN NUMBER

1 lb. = 7,000 grains
1 skein or lea = 120 yds.
1 hank = 840 yds.
yarn number (or hank roving) = hanks in 1 lb.
yarn number (or HR) = 1 ÷ weight (in lbs.) of 1 hank
pounds in 1 hank = 1 ÷ yarn number (or HR)
yarn number (or HR) = hanks ÷ weight (in lbs.)
pounds = hanks ÷ yarn number (or HR)
yarn number (or HR) = 8.33 ÷ wt. (in grs.) of 1 yd.

$$\text{yarn number (or HR)} = \frac{8.33 \times \text{yds.}}{\text{wt. (in grs.)}}$$

$$\text{wt. (in grs.)} = \frac{8.33 \times \text{yds.}}{\text{yarn number (or HR)}}$$

$$\text{yds.} = \frac{3 \times \text{wt. (in grs.)} \times \text{yarn number (or HR)}}{25}$$

Roving or yarn on bobbins, spool, or beam

$$\text{yarn number (or HR)} = \frac{\text{ends} \times \text{yds. in each end}}{840 \times \text{wt. (in lbs.)}}$$

$$\text{yds. in each end} = \frac{840 \times \text{wt. (in lbs.)} \times \text{yarn number (or HR)}}{\text{ends}}$$

$$\text{wt. of yarn on beam, etc.} = \frac{\text{ends} \times \text{yds. in each end}}{840 \times \text{yarn number (or HR)}}$$

$$\text{ends on beam} = \frac{840 \times \text{wt. (in lbs.) of yarn on beam} \times \text{yarn number}}{\text{yds. in each end}}$$

SPINNING FRAME

Spindle speed

Band drive

$$\frac{\text{rpm. of spindle whorl}}{\text{rpm. of cylinder}} = \frac{\text{dia. of cylinder} + 1/8 \text{ in.}}{\text{dia. of whorl} + 3/16 \text{ in.}}$$

Tape drive

$$\frac{\text{rpm. of spindle whorl}}{\text{rpm. of cylinder}} = \frac{\text{dia. of cylinder} + 1/16 \text{ in.}}{\text{dia. of whorl} + 1/16 \text{ in.}}$$

Twist

$$\text{tpi.} = \frac{\text{rpm. of spindle}}{\text{surface speed of front roll}}$$

$$\text{rpm. front roll} = \frac{\text{S.S. front roll}}{\text{cir. front roll}}$$

$$\text{tpi.} = \frac{\text{driven gears} \times (\text{rpm. whorl} \div \text{rpm. cylinder})}{\text{driver gears} \times \text{cir. front roll}}$$

$$\text{twist gear} = \frac{\text{driven gears} \times (\text{rpm. whorl} \div \text{rpm. cylinder})}{\text{driver gears} \times \text{tpi.} \times \text{cir. front roll}}$$

twist constant = tpi. × twist gear
twist gear = twist constant ÷ tpi.
tpi. = twist constant ÷ twist gear

$$\text{twist gear} = \frac{\text{twist constant}}{\text{twist multiplier} \times \sqrt{\text{yarn number}}}$$

To calculate twist changes:

$$\text{twist gear needed} = \frac{\text{present tpi.} \times \text{present twist gear}}{\text{tpi. needed}}$$

$$\text{twist gear needed} = \frac{\sqrt{\text{present yarn number}} \times \text{present twist gear}}{\sqrt{\text{yarn number needed}}}$$

Draft

$$\text{draft} = \frac{\text{driver roll gears} \times \text{dia. front roll}}{\text{driven roll gears} \times \text{dia. back roll}}$$

$$\text{draft gear} = \frac{\text{driver roll gears} \times \text{dia. front roll}}{\text{driven gear on front roll} \times \text{draft} \times \text{dia. back roll}}$$

draft constant = draft gear × draft
draft gear = draft constant ÷ draft
draft = draft constant ÷ draft gear

$$\text{actual draft} = \frac{\text{yarn number} \times \text{doublings}}{\text{HR fed}}$$

To calculate draft changes:

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present draft}}{\text{needed draft}}$$

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present yarn number} \times \text{HR to be used}}{\text{yarn number needed} \times \text{present HR}}$$

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{present yarn number}}{\text{yarn number needed}}$$

$$\text{draft gear needed} = \frac{\text{present gear} \times \text{wt. of 120 yds. of yarn to be spun}}{\text{wt. of 120 yds. of present yarn}}$$

Lay

$$\text{lay gear needed} = \frac{\text{present gear} \times \sqrt{\text{present yarn number}}}{\sqrt{\text{yarn number needed}}}$$

Production

$$\text{banks of yarn per spindle in 8 hrs.} = \frac{8 \times 60 \times 3.1416 \times \text{dia. front roll} \times \text{rpm. front roll}}{36 \times 840}$$

LOOM

Pick gear

ppm. = ppi. × surface speed of take-up roll
S.S. take-up roll = rpm. × cir.
ppm. = ppi. × rpm. take-up roll × cir. take-up roll

If the loom has a pick-pawl take-up (pick gear is a driven gear):

$$\text{ppi.} = \frac{\text{driven gears in pick-gear chain}}{\text{driver gears} \times (\text{cir. take-up roll} - 2\tfrac{1}{2}\%\ \text{cir. take-up roll})}$$

$$\text{pick gear} = \frac{\text{driver gears in pick-gear chain} \times \text{ppi.} \times 0.975\ \text{cir. take-up roll}}{\text{driven gears (except pick gear)}}$$

pick constant = pick gear ÷ ppi.
pick gear = pick constant × ppi.

If the loom has a double-worm take-up (pick gear is a driver gear):

production = pick gear × ppi.
pick gear = pick constant ÷ ppi.

$$\text{pick gear needed} = \frac{\text{present gear} \times \text{ppi. needed}}{\text{present ppi.}}$$

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How Will The Textile Industry Find College Graduates

Hugh M. Brown, Dean
School of Textiles

Over a period of years, since 1950 to be more specific, there has been a steady downward trend in the number of students taking textile training in colleges. This seems somewhat surprising in face of the ever increasing demand for college men with training in the textile field and all the more surprising with the almost unlimited opportunities for careers in the textile industry. Especially in the South, where textiles is the largest industry, it is surprising that industrial minded men have not chosen this field since normally there is a strong desire of southern boys to work in the South.

At the meeting of the National Council of Textile Education this problem was considered at length by representatives from the twelve textile schools of the nation. The conclusions of this group were that the diminishing interest in a career in textiles has resulted largely from the tremendous publicity campaigns that have been waged for the past several years by other industries, extolling in glamorous fashion the career possibilities in other fields of engineering such as Utilities, Chemicals, Electronics, Petroleum, Aircraft, etc. This has often placed great stress on high starting pay and though promising advancement possibilities have in most cases not given definite figures.

It is believed that if a similar campaign were made by textile organizations and associations, not only in textile magazines but in others having a much wider circulation, a greater number of high school graduates could be guided toward textiles. It is also felt that if textile concerns would make more contacts in their local communities many students might be awakened to opportunities awaiting them in their own localities. In Alabama the mills throughout the State gave Open House days for high school seniors which resulted in an increase in the number of the graduates choosing textiles.

It seems there is little doubt that if the high school students and their parents would take a careful look from a long term viewpoint, that they would find opportunities in textiles excelling those in most other industries. The textile industry having so many segments has a tremendous number of administrative and executive positions and a recent study by "Fortune Magazine" showed that on salaries of top management in the several industries, textiles was practically the leader of the list and that the average age of the textile executive was younger than that for other industries. It was also brought out by one of the largest textiles companies in the nation that though in some cases the starting pay in textiles is not as high as in other engineering fields, that the salaries of the average college graduate in textiles in three to five years caught up with those paid in other engineering fields and, thereafter, reached considerably higher levels than in most any other industry. At a meeting of the National Council of Education a year ago, Mr. Roger Milliken, President of the Deering Milliken Company, stated that the competitive nature of the textile industry creates enormous opportunities in the textile industry which are not so great for Utility, Railroad or other types of industry where competition is not as keen.

Mr. Robert O. Arnold, President of the Covington Mill, Covington, Georgia states, "Except for a few men who have gone to top jobs with utility companies, the textile graduates I know are doing far better than those of any other branch of engineering." Mr. Leon Lowenstein, President of M. Lowenstein & Sons, a firm which has yearly sales of $250,000,000 stated, "Today, houses like my own are looking for the calibre of young men who will eventually fill top jobs, and a Class A textile school education is definitely an asset. Most of the top flight men with our firm are all graduates of textile schools. If you were to ask them if they had a chance to start their careers over again, they would tell you that they would do the same thing again."

At Clemson a study was made of the earnings in 1953 for the former graduates of our School of Textiles. These figures are shown in Table I. It is felt that these figures show higher earnings at any time beyond five years from graduation than are had for the various engineering groups in other fields. All in all it seems the high school graduates are not giving sufficient consideration to the career possibilities in the textile industry and this raises the question of what can be done about it. The Textile School at Clemson is putting on a more extensive campaign on high school days and through the high school principals to acquaint the students with the opportunities available, but it is felt that campaigns conducted by textile organizations and associations would be much more effective than pleas from our school. It is the textile companies that will employ the graduates and their statements would carry far more weight if the need is stressed by them. If they would give some publicity similar to that being used in other engineering fields and place some of it in non-textile magazines which are read by a far wider group than read the textile journals, it seems possibly a larger percentage of the high school graduates could be interested in textiles.

In the long view there should be a bright future for textiles. It is estimated that by 1975 the population of the nation will have increased by 45 million people. This will furnish a steady increase in the market for textiles of all sorts, wearing apparel, home fabrics, automobile and airplane fabrics as well as an increase in industrial fabrics used in the additional manufacturing that will be required to supply the various goods for the increased population.

The increased automaton and electronic control being used in the textile industry will demand an ever growing need for men with college training. The research being devoted to textiles is growing by leaps and bounds and will furnish innumerable opportunities for trained men. The big problem is to bring the true story to the attention of potential students showing that over the years textile graduates will probably fare better than most any other group.

The alumni receiving this magazine can do much to bring the message to the youth of their several communities. Unless the boys are encouraged to make a more careful comparison of career possibilities in textiles with those in other fields, the textile industry will be the loser by not obtaining sufficient suitably trained graduates and the students themselves in all too many cases will also be the loser by being lured into less favorably industries by high powered publicity.

The textile schools are all running below capacity that has been so amply provided in a large measure by the industry itself. There is no lack of faith on the part of the industry in the textile schools, else the large amount of direct aid would not have been forthcoming. The problem is to instill in the high school graduates a corresponding faith in the textile industry. If the efforts of the school to bring this about are enhanced both by the alumni and the textile organizations, it is believed textile graduates will be forthcoming and probably in no other way will sufficient students choose textiles in face of the strong publicity being given other fields.

TABLE I

Earnings in 1953 of Textile Graduates From 1901 through 1940

Earnings		Number of Graduates	Percent of Graduates
Less than	$ 4,000	7	2.1
$ 4,001 —	5,000	10	3.0
5,001 —	6,000	20	6.0
6,001 —	8,000	66	19.8
8,001 —	10,000	71	21.4
10,001 —	15,000	78	23.4
15,001 —	20,000	34	10.2
20,001 —	30,000	26	7.8
Over	30,000	21	6.3

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Processing Intimate Blends of "Dacron" Polyester Fiber and Cotton

(continued from October Issue)

W. Deane Belcher
Supervisor, Intimate Apparel Merchandising
Textile Fibers Department
E. I. du Pont de Nemours & Co.

Dyeing

Union and cross-dyeings of blends of "Dacron" and cotton can be readily made using disperse dyes on the "Dacron" and either vat or direct dyes on the cotton. Since well penetrated dyeings on "Dacron" have outstanding wet fastness properties, the use of vat dyes on the cotton gives a completely washable fabric. This combination is highly recommended although somewhat expensive. The use of direct dyes enables the dryer to use a one-bath technique that is more economical. If the direct dyes are after-treated, the fastness properties are adequate for many end-use requirements.

Vat Dyes on Cotton—Two-Bath Method

The "Dacron" polyester fiber should be dyed first. Dyeing the cotton cleans the "Dacron" very effectively. It also avoids the shade change that occurs with certain vat dyes when they are exposed to prolonged boiling in carrier baths. Detailed procedures are as follows:

The method most widely used in dyeing fabrics of spun "Dacron" is in a conventional covered beck using "Dowicide" (11) A as the carrier. The amount of carrier to be used will depend on the depth of shade, bath volume ratio, and percentage of "Dacron" polyester fiber in the blend. A good rule to follow for blends is to use 1.5 grams per liter of "Dowicide" A **plus** the following percentages based on the weight of "Dacron" only:

Light Shades, 10% "Dowicide" A
Medium Shades, 15% "Dowicide" A
Heavy Shades, 20% "Dowicide" A

The dye bath should be set at 120°F. and 0.5 per cent "Avitone" (12) T softener added. "Dowicide" A flakes should be dissolved in plenty of hot water (160-180°F.) together with 0.2 grams per liter caustic soda, 0.1 grams per liter ammonia (ammonium hydroxide), 0.5 per cent "Aivtone" T softener. After slow straining into the dyebath, the solution should be circulated 15 minutes while raising the temperature to 120°F. A well diluted solution of acetic acid should be added slowly to the dye bath, using 1.0 pound of glacial acetic acid for every 30 pounds of "Dowicide" A. The pH should be between 5 and 6, adjusted to this level if necessary. Di-ammonium phosphate is often used in place of acetic acid since the pH in this system is self-regulating. The bath should be circulated for 15 minutes. The disperse dyes are pasted with one per cent of "Avitone" (13) T softener and hot water added, without exposing the dyes to live steam injection. After adding the dyes to the bath, the dyebath temperature is raised to the boil over 45 minutes and the fabric dyed at the boil for at least one hour before sampling and not for less than two hours total. If adds are necessary, the dyebath should be cooled to 180F. before adding the disperse dye. After cooling the dyebath with an overflow rinse, the bath is dropped, followed by scouring with "Duponol" RA surface active agent and caustic soda for 20 minutes at 180°F. If the cotton is to be vat dyed later, the scour can be omitted.

Another method of dyeing "Dacron" polyester fiber is in a pressure system at 250°F. without a carrier. The use of 2.0 grams per liter methyl lactate or 2.0 per cent acetic acid (glacial) to insure dye stabilization is recommended. This method is much more economical and give shades of greater clarity and fastness. Fabric can be dyed at 250°F. in a Barotor or at 235°F. in a beam dyein gmachine. Many package dyeing machines have been equipped to handle the pressures and temperatures required to dye yarn at 250°F.

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A list of disperse dyes recommended for use on "Dacron" that gives shades of excellent fastness is given below:

"Latyl" Yellow LY
"Celanthrene" (14) Fast Yellow GL Conc. 300%
"Acetamine" (15) Fast Yellow 4RL
"Latyl" Orange R
"Celanthrene" Cerise B
"Latyl" Red B
"Latyl" Violet 2R
"Latyl" Violet BN
Latyl" Blue FL
"Latyl" Brilliant Blue 2G
"Latyl" Brilliant Blue BG

For cotton, the vat dye is preferably applied from a reduced bath and is reoxidized by conventional methods in a jig or beck. The continuous pad-steam method also gives excellent results although it is commonly used on fairly large yardages. If the cotton is dyed last, a thorough soaping should follow oxidation.

Direct Dyes on Cotton—One-Bath Method

In the application of direct and disperse dyes to fabrics blended of "Dacron" polyester staple and cotton by a one-bath process, "Dowicide" A is again the preferred carrier. The detailed dyeing procedure for the blend follows exactly the process outlined above, but with the following additions and changes:

The direct dye is dissolved and added separately from the disperse dyes but at the same temperature.

Dyeing of the "Dacron" polyester fiber is carried out between pH 7.0 and 7.5 instead of 5.5 since direct dyes are adversely affected by a low pH. Sodium dihydrogen phosphate ($NaH^{2}PO^{4}$) is preferred for neutralizing the alkaline "Dowicide" A.

No salt is added for the direct dyes until the shade is matched on the "Dacron."

The finished dyeing is scoured for 15 minutes at 120°F. with 0.5 grams per liter of Product BCO(16) textile processing agent. The addition of salt to the scouring bath may be required in a number of instances to hold the shade on the cotton.

An aftertreatment of the direct dyes is recommended to improve wetfastness.

Developed Dyes on Cotton

Very good results have been obtained by applying developed dyes ("Pontamine"(17) Diazo dyes) to the cotton and disperse dyes to the "Dacron" simultaneously. After dyeing the "Dacron" at the boil, the cotton color is developed by the normal cold diazotization. This technique gives much better wetfastness than regular direct dyes although the all-round fastness is not quite as good as with vat dyes.

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FINISHING

Wire or Bristle Brushing

The resistance to pilling of certain spun fabrics has been improved by including a brushing operation in the finishing. The brushing removes some loose fibers and raises others, which are later removed by shearing and/or singeing. Several types of equipment have been used for this process, including nappers, despeckers, sanders and bristle brushes. In addition, the modified tiger has been found useful in experiments by the Du Pont Company. Caution should be used on the lightweight, open construction fabrics to prevent such steps from mechanically degrading the fabric. The brushing or napping equipment in the individual mill should be tested with each fabric to determine the proper settings for the desired results.

Heat-Setting

Heat-setting is necessary for fabrics blended of "Dacron" polyester fiber and cotton to obtain thermal dimensional stability as well as improved resistance to pilling. Heat-setting at 380°F. for 45 second exposure is preferred on a pin or clip tenter. The best resistance to pilling has been obtained when shrinkage is allowed in both the warp and filling. Three to seven per cent allowances have been effective. Other heat-setting equipment, such as hot roll and hot air—hot roll, has been found to give equivalent results to the tenter frame.

Brushing and Shearing

This operation has proved advantageous especially where a bristle or wire brushing has been included in the finishing of the fabric. Long fibers raised by brushing melt to form a polymer bead on the surface of the fabric when it is singed. These polymer beads will impart a harsh, sandy hand to the fabric. Shearing will crop the long fibers and minimize the formation of these beads. Brushing at this stage merely helps to stand the fibers up for the shearer blades and does not do much to remove loose fibers from the fabric.

Singeing

Singeing is probably the most important single finishing operation that is used to reduce pilling. A deep, thorough, evenly applied singe, preferably by two flame exposure (face and back), is often necessary to get good resistance to pilling. Since every singer is different, standard operating conditions cannot be suggested. Each finisher should experiment with his equipment until optimum flame settings and linear speeds have been determined for each fabric style.

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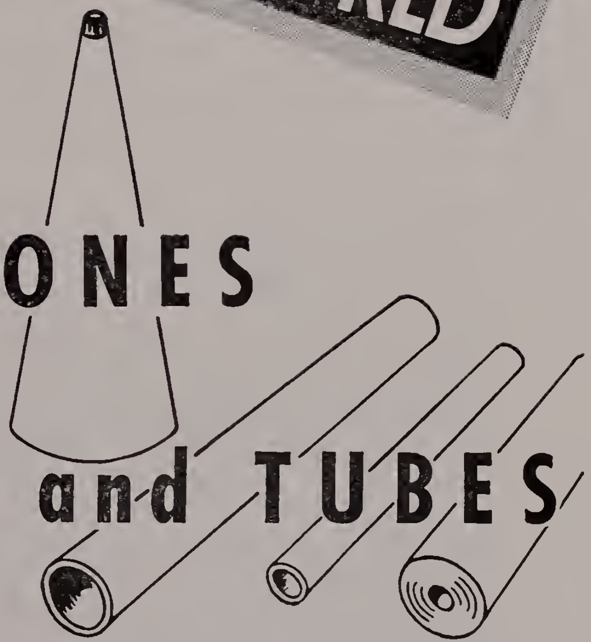

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Sequence

The order in which each of the above operations is performed may be varied to fit the needs of each individual fabric. However, the best sequence of operations is as follows:

Procedure I

Desize
Scour
Mercerize
Bleach
Dye
Wire or bristle brush
Heat-set
Brush and shear
Singe
Scour
Compressive shrink

This sequence would be followed for a fabric having inherently poor resistance to pilling. If the fabric were to be finished white, bleaching could be done after singeing in place of the scour. If the greige goods are clean, it may be possible to brush, heat-set and singe in the greige, followed with wet processing. To prevent shading and loss of dye-receptivity this procedure should be avoided. In this case, all heat treatments should follow dyeing, but here too, close attention is required in the selection of dyes and heat-setting conditions to avoid dye sublimation.

If the greige fabric is relatively free of stains and dirt, and has good inherent resistance to pilling all of the above mentioned steps may not be necessary. In this case, a procedure such as the following may be acceptable:

Procedure II

Heat-set
Singe
Desize
Scour
Bleach
Compressive shrink

It is important that heat-setting precede singeing to prevent uneven setting and shrinkage of the fabric. The need for cleanliness of the greige goods is emphasized if this sequence is used, otherwise stains will be set in the goods which may prove very difficult to remove. Procedure II should be considered the minimum treatment that is necessary for fabrics blended of "Dacron" polyester staple and cotton.

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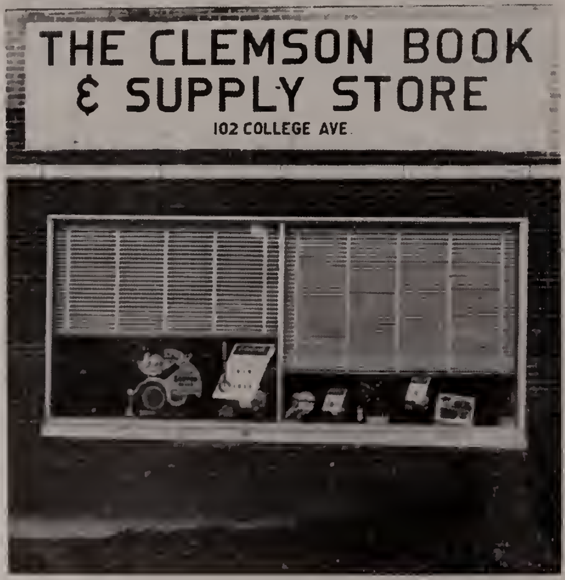

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Effect of Synthetic Fibers on Ceramic Industries

By Larry Bell, Cr. En., '56

Just as the automobile changed the field of transportation, so man-made or synthetic fibers have completely revamped the field of textiles. New machines, new techniques, and new and inter-related industries have resulted from this great discovery. Usually the textile and ceramic industries appear to be far apart, but the truth of the matter is that millions of dollars a year are accredited to the textile divisions of various ceramic industries. The outstanding industries are that of glass fibers and thread-guides.

Fiber glass is one of the newest synthetic fibers. Its first appearance in the form of yarn in the 1930's was the climax of countless attempts to commercially make a truly flexibly fiber of glass. The initial step toward the establishment of the glass textile industry as it is today was taken in 1931. At this time research was begun in the field of glass in many fiberous forms—one of which was the textile fiber. By 1938 development had progressed to that point where production of the fibers in commercial quantities at competitive cost was realized.

The basic properties and various physical and chemical characteristics of fiber glass yarns are as distinctive as those of cotton, wool, asbestos, and rayon, and like those other fibers, motivated modifications and additions to existing textile nomenclature and terminology.

The manufacture of fiber glass yarns is delicate and rather unique. Two processes represent the techniques for almost all fiber glass yarns. These processes are the continuous filament and staple fiber. In the continuous filament and staple fiber processes the diameter of the fiber is accurately controlled by regulating the viscosity of the molten glass through temperature control, by the size of the orifices through which the glass flows by regulating the rate of speed at which the fibers are drawn.

The continuous filament process provides truly continuous filament of indefinite length having an exceptional brilliance and continuity. The fibers are formed by mechanical attenuation. Molten glass flows through temperature resistant metal alloy feeders having small orifices. As the fine streams of molten glass emerges from these holes, they are gathered together, run over a pad where sizing is picked up and then carried to a high speed winder. Because the winder revolves at a much faster rate than the stream flow from the melting chamber, the tension attenuates the glass while it is still molten and thus draws out filaments that are a mere fraction of the diameter of the orifices. The winder draws out the continuous filaments at rates above two miles a minute.

After being drawn into a forming tube, the continuous filaments are subsequently processed into glass fiber yarns and cards through conventional twisting and plying operations on standard textile machinery.

The staple fiber process forms a fiber having long-staple characteristics. It uses jets of compressed air to attentuate or draw out the molten glass into fine fibers. The molten glass flows through orifices in temperature-resistant metal alloy feeders at the base of each furnace. The impact of the compressed air literally yanks the thin stream of molten glass into fine fibers varying in length from 8 to 15 inches. The fibers are driven down onto a revolving drum on which they form a thin veil resembling a cobweb.

In their most instantaneous descent to the drum, the fibers pass through a spray of lubricant and a drying flame. This web of fibers is then gathered from the drum into a sliver that is lightly drafted in the ensuing winding operation so that the majority of the fibers be parallel with the length of the sliver. These soft slivers can be further reduced in diameter, if desired, and then twisted and piled into yarns of various sizes using textile machinery and processes similar to those employed for long staple materials.

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A variety of textile products manufactured of glass fiber yarns are designed for a multitude of specific end uses. Manufacturers of electrical equipment and wire and cable were the first major users of fiberglass textile products. Resistance to moisture, rot, chemicals and high temperatures combined with a high strength-low bulk ratio result in a high demand for fiber glass textile products for a carrying medium and reinforcement for impregnants used for insulation in electrical equipment. Fiber glass yarns and scrim have provided the paper industry with the ideal reinforcement for paper and tapes. Demand has increased sharply for all-glass marquisette curtains, screen print draperies, and casement cloths. There are hundreds of other uses for this product which are not inlightened by the scope of this article.

Thread Guides

Synthetic fibers are far more abrasive than the natural fibers such as cotton and wool, which composed the greater part of textile activity prior to the discovery of rayon. In addition, many synthetic yarns are processed in smaller deniers at high speeds and tensions. This has greatly accelerated the wear in guides.

The first guides used in producing rayon were probably selected on the basis of acid resistance, with abrasion resistance a close second. Metals were generally discarded due to the ease with which acids attacked them. Agate and synthetic sapphire met the basic requirements but were extremely expensive and limited in supply. Both of these materials were handicapped because the various designs and sizes had to be machined from the hard bulk, raw material. Designs were necessarily kept simple and for the most part confined to rods, which did not always make efficient handling or economical processing.

Glass and glazed porcelain have been used in a great many functions satisfactorily, but for the most part do not have sufficient wear resistance. The thin glazed surfaces of porcelain speedily break down under the abrasive action of the yarn. Filament breaks, plus the continual inspection for worn guides, plus the expense in constantly replacing these guides tends to make them uneconomical for general use. Another problem to be considered is the amount of static electricity caused by increased frictions at high speeds.

Through research, a suitable ceramic guide was produced. These guides can be made to almost any shape since it can be dye pressed, extruded, casted or machined in the unfired state. The final product has a hardness of 8 on Moh's Scale. It is homogeneous, easily polished and resists all acids except fluorine compounds. The accuracy to which it can be made makes possible closer control of yarn processing, and quite often allows increased speeds.

Scholarships and Financial Aid

By William C. Whitten
Assistant Professor of Textiles
Chairman, Student Awards Committee

It is surprising to most people to learn that the total amount of scholarship and other financial aid available to students enrolled in the School of Textiles is considerably larger than they had realized. It is also surprising to those of us involved in the awarding of this money that so little interest is shown by those eligible to receive it.

At the present time, the school has no scholarships available to entering freshmen. Most of the awarding companies feel that a student should prove himself in college for a period of time before becoming eligible for financial aid, and since there is never enough money to help all those requesting it, it is probably better to help those who have proved themselves a success for one, two or three years. There are, however, scholarships available to students in all the other years as well as for graduate study. Some of these can be held for two years if a student continues good work.

Most of the scholarships are awarded on the basis of need, scholastic ability, character, leadership or some combination of these features. Though a few do not consider financial need, most make this one of the factors for consideration.

Some of the companies granting scholarships of all types which are available to textile students are the following:

American Association of Textile Chemists and Colorists
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These awards amount to more than $5000 annually. In addition, probably even more scholarships are awarded by companies, usually to students in the city in which the company is located, than by the Textile School itself. The college has nothing to do with these grants, and those in need of help should make inquiries as to their availability.

In that regard, a word of advice; don't hesitate to apply for financial help if you feel you can qualify. Don't be modest or bashful about it. Someone is going to get the grant and you never know the qualifications of the other men. Yours may be the best. Sometimes we almost have to beg for applicants. Come forward and apply.

In addition to outright grants, there are a number of loan funds both by the college and by industries of the state. Of course, these have to be repaid, but at little or no interest.

Also the college has a few jobs which are filled by student help. The Director of Student Aid should be contacted concerning this. He also can locate outside jobs at times for some.

And finally, I would recommend to prospective students that they seriously consider the financial aid that can be acquired by participation in the ROTC program. It is no small change, and is outlined in the college catalog.

If a student is a good student, I don't believe that the faculty and administration will fail to find some way for him to overcome financial difficulties in order to remain in college.

Outstanding Seniors

Mack Gerald ("Rock") Fleming, a textile manufacturing student from Anderson, South Carolina, holds the rank of 1st Lieutenant in the Armor Division of the ROTC. He attended summer camp at Fort Knox, Kentucky, where he was recognized as a Distinguished Military Student.

Rock is a member of the Block "C" Club, N.T.M.S. and Phi Psi. He is head manager of the football team this year. He received high honors during his sophomore, junior and senior years.

Rock is attending Clemson on a four-year scholarship given by Abney Mills of Anderson, South Carolina. After two years in the Army, he plans to enter the dyeing and finishing or production departments of Abney Mills.

Thomas Edward Boyce, a textile engineering major, hails from Joanna, South Carolina. In order to learn more about textiles, he has worked at Joanna Cotton Mills during the last four summers. He has worked in the laboratory, spinning room and spooler room.

Tom is a member of Phi Psi, Phi Eta Sigma, Phi Kappa Phi and S.A.E. He served as secretary of Phi Psi during his junior year and is currently serving as president of that fraternity.

Thomas won a Keever Starch Scholarship his sophomore year and an Inter-Chemical Scholarship for his junior and senior year. Upon graduation in June, he hopes to continue his studies at the Institute of Textile Technology.

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At the Annual Meeting of the South Carolina Textile Manufacturers Association held at Sea Island in May of last year, the wives and daughters of members modeled dresses of material processed in South Carolina mills.

Several months prior to the meeting a letter was sent to every lady who would be present at the banquet, asking her if she would wear on that occasion a dress made of material from a plant with which her family was connected. The only requirement was in regard to the basic material used. She could trim it as she pleased; no restrictions as to lace, frills, furbelows or buttons. It could be made by a French designer, her favorite slip cover seamstress, or by herself. But the basic material must come from a South Carolina mill in which a member of her family was interested.

In the letter she was informed that prizes would be given for the "Gayest", "The Most Beautiful", "The Dreamiest", "The Most Scintillating", "The Leastest With the Mostest", "The Most Sophisticated", "The Most Original", "The Most Exotic", "The Most Glamorous", "The Nicest to Come Home to", "The Darndest", "The Prettiest", "The Trickiest", and "The Most Versatile". In other words, they were to use their own imagination and ingenuity. Well—they did all that and more. Eighty-three of the fair sex came ready to vie with each other and also to charm the men-folk with beautiful, amusing and original costumes.

An element of surprise entered into the evening when a few of the men appeared in suits made of material of their own making.

The ladies made their first appearance on the patio. The soft, balmy air of a summer's night with a bright moon shining through the oaks bearded with moss, and off in the distance, the faint chant of the darkies' Spirituals added a touch of glamour and made a beautiful setting for an enchanting evening.

A very lovely young lady wearing a period gown of white broadcloth trimmed with cotton scroll lace won the prize for "The Most Beautiful".

The sensational dress of the style show was made of diaper cloth from Kendall Cotton Mills, trimmed in blue polka dots, with safety pins used as fastenings for my lady's shoes, a large blue ostrich feather in her hair and a matching fan in her hand completed the bizarre costume entitled her to "The Darndest" prize.

The prize for "The Most Exotic" was won by an attractive young matron, whose dress was made of Fiber glass.

A costume of striking originality was created of Belrug materials with parasol to match. The first prize went to one who made, with her own hands, a dress using materials from twenty-five South Carolina mills. The prize for "The Prettiest" was a dress made of 80-square print cloth from Alice Manufacturing Company.

The few described here are but a mere sample of the near hundred attractive and outstanding costumes worn that night. The style show served to point up the fact that it is unnecessary for us to import foreign fabrics, for beautiful and unusual creations can be achieved with materials made in South Carolina.

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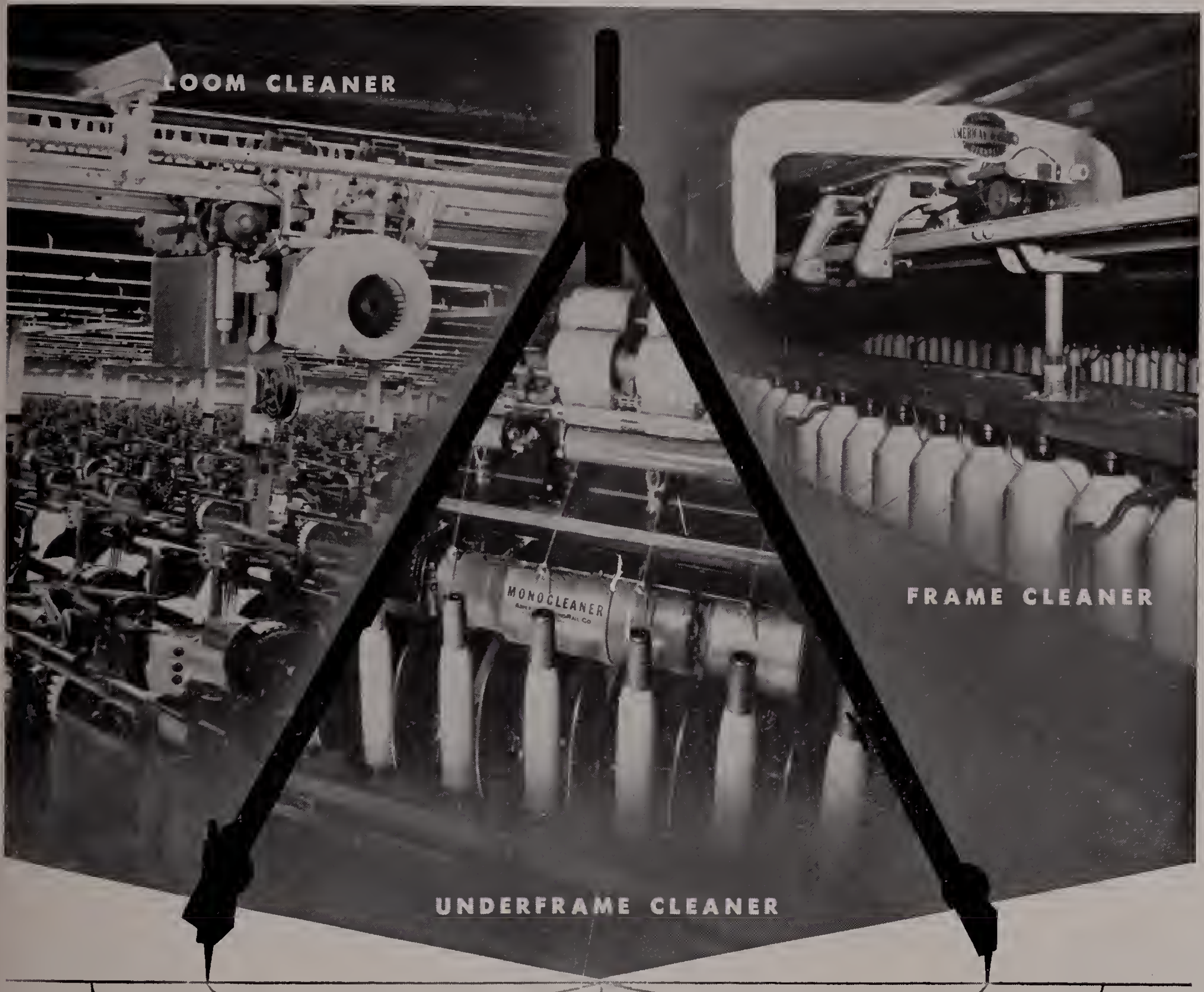

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THE COVER:
By TED PAPPAS '57

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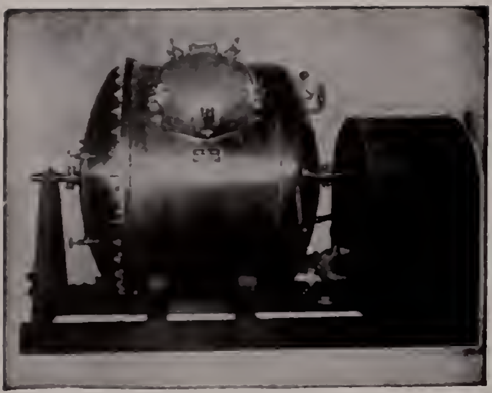

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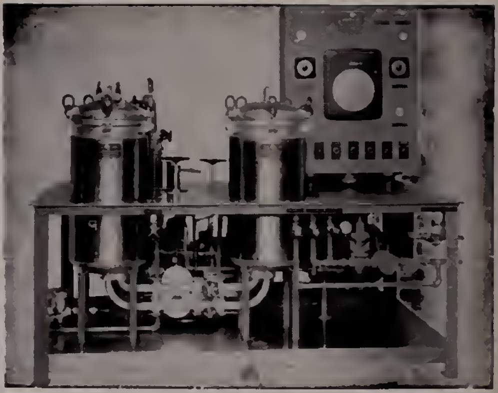

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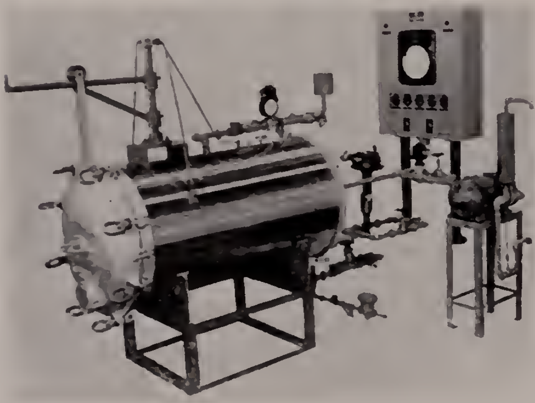

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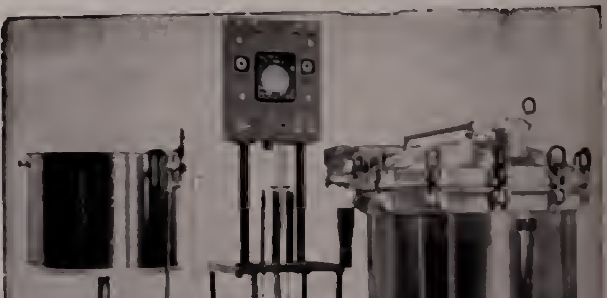

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School Develops A Constant Winding Yarn Tester

By

Hugh M. Brown, Dean
School of Textiles

In constant winding testing instead of breaking a short specimen of yarn the yarn runs through the machine continuously for sufficient time to test any desired length of yarn. The principle is not new. There is currently offered a machine for continuous yarn testing by Cook and Company of Manchester, England, and one by Goshawk[1] in England. Earlier, in Germany I believe, there was a machine known as the Hahn continuous yarn testing machine and a number of others have been developed.

In some cases, the device is used only to obtain the number of low level breaks in long lengths of yarn with no means provided for measuring the elongation. The problem is more difficult when accurate measurement of elongation is involved. This is usually done by suspending the desired load in a loop of yarn and feeding the yarn into and out of the loop at the right speed to maintain the load at a more or less fixed level. In some cases the force required to give the yarn a fixed elongation in measured as the yarn runs continuously through the machine.

Though continuous testing may have several advantages over break tests, some of the machines for doing it have been somewhat complex mechanically, and some have had impractical features. In case the yarn is fed in and out of a constant tension loop by means of gripping rolls, the rolls become worn and polished and allow slippage of the yarn in spite of high pressure applied to the rolls. If slippage is recorded as elongation the result may be subject to large errors.

It is believed that in the machine developed at Clemson, the problem of slippage is completely solved by means of snubbing drums. At the same time the device is extremely simple, straightforward and practically free of any type of adjustment. Made of suitable material, it should last indefinitely, requiring no replacement of roll coverings or the like.

In this machine the yarn is fed into the load loop by one pair of steel snubbing drums and taken out of the loop by a second pair and thence to a take-up winder. The input drums run at a constant rate while the speed of the output drums is varied by the amount the load stretches the loop of yarn between the drums. When the yarn in the loop stretches more the weight is lowered which moves a steel spring belt on cone pulleys to drive the output drums at a higher speed. Thus, when the yarn is taken out of the loop at a rate equal to the input plus the elongation the loop will not be further lengthened and the weight will be suspended stationary. If following sections of yarn have more or less elongation the weight will move either higher or lower and adjust the belt on the cone pulleys to properly take up the slack in the loop. The height of the weight is a measure of the percent elongation in the yarn. Instead of having the weight simply hanging in the loop the load is applied by means of a load beam connected to the pulley in the loop so that the force on the yarn can be varied by moving a weight horizontally along the load beam in the manner of a weighing scale.

A pen arm attached to the load beam moves up and down with variation in elongation, thereby recording percent elongation on a moving chart as the yarn moves continuously through the machine.

By employing this snubbing arrangement many turns of yarn can be used on each pair of drums so that both the input and final take-up tensions may be as small as desired and yet feed the yarn into, and take it out of the loop at exactly the speed of the respective drums with no chance of slippage. The yarn structure is not altered as would be the case if the yarn were fed with squeeze rolls.

---

[1] JTI, Vol. 42, Page P8, 1951.

From the reading of the elongation on the chart and the load setting on the load beam, the average modulus between two given loads can be computed from the following relation:

$$\text{Modulus}_{ab} = \frac{C\ (F_b - F_a)}{E_b - E_a}$$ where F represents the load, E the elongation and C a constant depending upon the size of the yarn and the units used.

In Table I results taken in this manner for several yarns are shown.

Table I
Modulus by Continuous Winding Tester Compared with Values by Instron

Yarn	Continuous Winding Tester Force (gms)	Elongation %	Modulus gm/gx/%	Instron Elongation %	Modulus gm/gx/%
Acetate (166 gx)	25	.86		.20	
			.12		.20
	75	2.14		.96	
			.095		.14
	125	4.72		2.10	
			.032		.045
	150	9.43		5.4	
Cotton (2 ply) (350 gx)	50	1.28		.95	
			.15		.27
	150	3.20		2.1	
			.22		.26
	250	4.50		3.2	
			.22		.26
	350	5.80		4.3	
Cotton (Singles) (175 gx)	50	1.28		0.7	
			.23		.27
	150	3.85		2.8	
			.29		.32
	250	5.85		4.6	
Rayon (Filament) (333 gx)	50	.64		.2	
			.30		.60
	100	1.14		.45	
			.17		.24
	200	3.86		1.10	
			.054		.075
	300	9.43		5.00	
Dacron (Filament) (278 gx)	100	.86		0.3	
			.86		1.2
	200	1.28		0.6	
			.83		1.0
	400	2.14		1.3	
			.42		.55
	600	3.85		2.6	
			.56		.55
	800	5.14		3.9	
			.56		.61
	1000	6.43		5.1	
Nylon (Filament) (33 gx)	50	5.45		4.0	
			.44		.58
	75	7.28		5.3	
			.31		.54
	100	8.57		6.7	
			.44		.47
	125	10.28		8.3	
			.11		.16
	150	14.14		13.	
Orlon (Filament) (83 gx)	50	1.50		0.4	
			.46		.75
	100	2.80		1.2	
			.17		.22
	150	6.40		3.9	
			.19		.19
	200	9.00		7.0	

The modulus given by this method of testing yarn is somewhat lower than that obtained from usual stress strain curves. This happens because as each element of yarn enters the loop it is subjected to the total force for the length of time required to pass through the loop. Applying a given load in this manner will produce greater elongation than when the load is steadily increased from zero upward, where each load value exists only for an instant causing the elongation to be less than would be produced by the same steady load even if applied for only a few seconds. This point was verified on the Instron and Incline machines by quickly placing fixed loads on the yarn and noting the elongation produced after ten second intervals. It is believed that possibly the constant loading applied to the yarn through a considerable time interval as is accomplished by this machine is more like that which yarn will encounter during manufacturing processes and, therefore, the modulus computed from this data is possibly more valuable for some purposes than that computed from conventional stress strain curves.

It is possible with a modified arrangement to have the machine plot a stress strain curve, each part of the curve representing the average percentage elongation. By slowly moving the weight along the load beam from zero load upward, a stress strain curve is drawn. This curve will be somewhat wavy due to variations in the elongation of the yarn. The oscillations of the pen caused by these variations are superimposed on what would be a smooth curve if the yarn were uniform. To eliminate long range variations in the yarn the curve can be traced several times for different portions of the yarn. The several tracings would parallel each other covering an area through which can be drawn an average curve. Of course the machine cannot produce curves extending to the breaking point of the yarn without becoming unthreaded.

It is possible to arrange for the weight and chart to be moved back and forth automatically so that the stress strain characteristics of long lengths of yarn can be displayed without continuous attention of an operator.

If the belt guide is removed, stress strain curves can be taken with the yarn stationary by simply moving the weight along the beam, and in this case the load could be increased sufficiently to obtain the breaking strength. Before curves for static tests are made, yarn must be run through at zero tension before each break. By adding suitable jaws the machine could be used for making standard yarn breaks with definite gage lengths.

Another application of the machine is to detect and record potential weak places in a yarn. This feature can be accomplished by placing an adjustable micro switch so that when the elongation exceeds any desired maximum level an electro magnet will lift the load beam before the yarn is entirely broken. By means of a delay mechanism the load is restored to the yarn after the weak place has had sufficient time to pass through the loop. An electric counter also actuated by the closing of the micro switch records the number of weak places in any desired length of yarn.

The machine may be altered to measure force at constant elongation instead of elongation at constant force. To do this the belt guide is arranged to set the percentage elongation to any desired value. The loop pulley is mounted on a strain gage bar and the force produced in the yarn is measured by means of a strain gage amplifier and recorder. The pulley may be moved up or down for different gage lengths. This is probably a better way to operate the machine if an amplifier and recorded are available. In this method, since the belt is not moved by the yarn, there is no delay in reading the force as is the case when measuring elongation at constant load. Very rapid variations in force can readily be measured by means of the strain gage set-up. The yarn modulus is computed in the same manner as for the first method of operation.

Advantages of Continuous Yarn Testing: Some of the advantages usually claimed for continuous yarn testing over individual break tests are the following:

1. Since yarn breakage in processing occur only at the weakest places in a very long length, testing the yarn in such a manner as to measure these very weak places gives a better indication of yarn performance in the mill than conventional single end testing on 10-inch gage lengths, which gives an average of many strong places and only a very few of the troublesome weak spots.

2. In a given length of time a much larger amount of yarn can be tested, greatly increasing the chance of finding the weakest places. It is a matter of chance of single thread tests ever finding weak breaks.

3. Yarn can be automatically tested at higher speed than with automatic single thread break testers.

4. Possibly the lower modulus obtained by continuous yarn testing correlates better with ends down in processing.

Work is to continue in comparing this test method with the conventional single end test. Comparison is to be made of the degree of correlation of each method with such phases of yarn performance as: coefficient of variation in yarn strength, ends down in spinning, etc.

Appreciation is expressed for the suggestions and help in the development of this machine by members of the research staff, Professor J. S. Graham and Machinist Jack Leard.

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What is my future in the Textile Industry? Where should I locate? Should it be in the United States? Abroad? What branch of the industry should I enter? Production, Research Sales, etc., etc.?

These and many other questions face the graduate of a Textile Engineering School as he finishes his studies and faces the decision as to the type of career he wishes to follow.

The Textile Industry throughout Latin America is expanding rapidly with each country doing its best to become self-sufficient in the production of materials for clothing as well as textiles for industrial use. Such a development offers many job opportunities to the young engineer both in the field of production as well as in sales and merchandising. In past years, in the United States and also abroad, the average graduate has considered his future to be in the realm of production of fabrics. More recently it has become increasingly apparent that there is a great shortage of competent people to take care of the sales and merchandizing of the products manufactured by the mills.

A merchandizer can be defined as a man with "one foot in the sales office and one in the mill." He is the "bridge" between sales and production and is, therefore, a vital link in any textile organization. Merchandizers have often come up from the ranks of sales trainees, salesmen, etc., but it is clearly obvious that a man with a technical background can progress much faster, in the field of merchandizing, if he has a "sales personality".

For this reason there is a growing trend among both domestic mills and overseas organizations to hire textile engineering graduates for training in the field of merchandizing, styling, etc. In this country the need has not been so great due to the fact that merchandizers could be developed from salesmen over a period of years. However, in Latin America the textile industry is growing at such an accelerated rate that time is of the essence and the more training a man has the more rapidly he can be adapted to a given job.

Most South American organizations, whether totally owned by American Companies, affiliates of American Companies or separate South American organizations, are feeling an increasing need for the constructive thinking, positive action and advanced styling that can be furnished by an alert merchandizer. Competition increases with the opening of each new mill and the only hope of keeping ahead of a competitor is to operate economically and keep abreast of the latest fashions.

The next question that might arise is "How Do I Go About Locating Such a Position?" The answer to this is through your Placement Office, by studying advertisements in leading textile magazines and writing to firms known for their international operations such as United Merchants and Mfrs. Inc., and also by contacting foreign consultants and textile organizations.

A decision to go abroad should not be considered lightly as it is a serious step deserving much consideration. There will most likely be a period of training in the United States in which the graduate would spend from six months to a year going through a regular course for salesmen such as is conducted by most large textile firms in New York City. He would also receive training in production control and mill organization.

After being transferred to the South American plant the "trainees" would spend an additional period of orientation during which he would become acquainted with the company, its policies, clients, manufacturing facilities as well as learn the language and customs of the people of that country.

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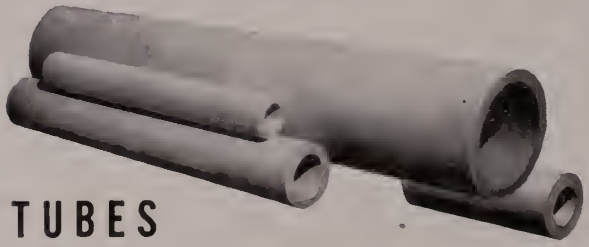

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Up to this point he has not been of much value to the company but on the contrary has been an "expense." His future, therefore, begins at the end of his training period and his success will depend entirely on how well he has assimulated his training and whether or not he has the style sense and creative ability to carry out the functions of his job.

With respect to this last quality it is the custom of many companies, before actually hiring a candidate, to subject him to a psychological test (such as the Klein Test) to determine if he has a "sales personality." I strongly suggest that the graduate insist on such a test in order to satisfy himself that his desire to enter the field of sales-merchandizing is based on firm grounds. Desire, education, ambition, etc., will be dissipated in failure unless the person has the invisible qualities of liking people, having a style sense, etc., etc. These psychological (written) tests often require five or six hours to complete but have proven, through the years, to be a valuable aid in the hiring of sales personnel.

None of the foregoing should be interpreted as indicating that there are no longer South American opportunities available in the field of production. On the contrary there are just as many as always and they require preliminary training. It was the idea of the writer to have this article present a new line of thought among textile graduates in order to widen the horizons of their future by suggesting a course of action that has not been explored thoroughly in the past. It is a little unique for a technically trained man to think of such a field but on the other hand competition might not be so great for those who enter first.

Latin America offers great opportunities to the alert textile graduate who is not adverse to spending his future abroad. Do not accept a job in this field in the spirit of a "vacation" or a few years abroad after which you will be transferred back to the United States. As you can see from the foregoing a great deal of time and money must be spent to prepare a man for foreign service so he must be agreeable to planning most of his future career abroad. It is generally customary for a company to return a man and his family to the United States for a three month vacation every three years and, therefore, you do not actually lose all contact with the past. In our organization we have many men who have achieved successful careers in South America, some having spent twenty years of residence abroad.

There is a wonderful opportunity abroad, in the textile industry, for the textile engineering school graduate and with a little foresight a successful career can be achieved.

Causes and Detection of Damage in Raw Cotton

By Dr. A. N. J. Heyn
Professor of Natural and Synthetic Fibers
School of Textiles, Clemson College, S. C.

In August of this year, data were collected by the author of this article from thirty mills in South Carolina concerning occurrence and importance of various types of damage of raw cotton under normal conditions in the mill. It was found that in South Carolina, various types of damage occur and that these may cause great difficulty and important financial losses. In the present series of articles, the different types of damage their causes, effects and methods for detection will be discussed.

The causes of damage may affect the raw cotton **at different points of time.** At the moment of the opening of the boll, infection of the mature fiber by certain microorganisms may cause so-called "**tightlock**", in which the fluffing of the locks is prevented and the fiber weakened. After the opening of the boll until harvesting, the cotton is exposed to so-called "**weathering**", damage in which microbial, temperature and photochemical processes play a part. During **picking and transportation**, tar and oil spots and similar stains may originate. During **storage,** microbial deterioration of cellulose is one of the main causes of degradation. A certain complex of characteristic changes in fiber properties in this period has been described under the name "**cavitoma.**" In the **ginning** process, overheating, overdrying, and overbeating are important factors which cause a weaker or shorter fiber and increased waste.

The various types of damage can be roughly classified in the following groups: 1. **Microbial damage,** 2. **Mechanical damage,** 3 **Chemical and photochemical damage,** 4. **Heat damage.** Their occurrences in the thirty South Carolina mills* was as follows: Twenty-seven mills reported difficulties in the spinning due to one or more of these types of damage; twenty-three reported damage by tar and oil spots; eleven reported damage from weathering; nine, damage caused in storage; twelve reported "cavitoma"; five, damage by yellowing of the cotton and the presence of fluorescent spots; and fourteen reported other types of damage, including gin damage and honeydew. From these reports, the practical importance of the damage problem for the mill may be recognized.

The present article will deal with **microbial damage** and its effect on the fiber properties. Next articles will deal with mechanical, chemical and heat damage. In a final article the detection and identification of damage will be discussed.

1. MICROORGANISMS ACTIVE IN DETERIORATION

Damage caused by the activity of microbes, especially molds or fungi has been extensively studied in mildewing of fabrics, but relatively less in raw cotton.

As many as one hundred million bacteria and five hundred fungi have been counted per gram of raw cotton. Many of these organisms are similar to those inhabiting the soil and decaying plant material. They persist during ginning, storage and manufacturing of the cotton and rapidly develop under suitable conditions, especially high humidity. Some, but not all of them, are capable of breaking cellulose down ("Cellulolytic" ability).

Microbes in tightlock — The organisms associated with tightlock are not always the same; they are representatives of a different genera of fungi (Diplodia, Colletotrichum, Fusarium, Alternaria). Infection takes place immediately after opening of the boll, upon the mature, but still unexpanded fiber locks. A wet period at that moment favors development. As a result, the locks may remain partly or fully unexpanded and the fiber is largely weakened and deteriorated. (Figure 1) The fibers of moderately tight locks may fluff out and be picked and mixed with normal cotton, lowering its grade.

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* The author wishes to express his thanks for the cooperation and interest received from the South Carolina Mills in this survey.

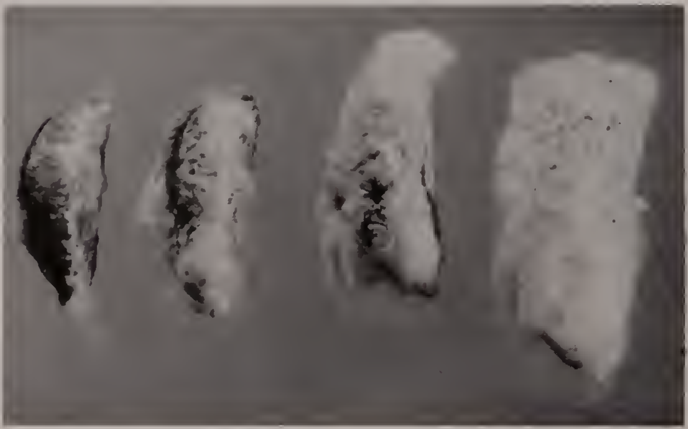

Figure 1. TIGHTLOCK. As a result of the early development of certain fungi on the fiber, the locks do not fluff out.

Microbes in weathering—After opening of the boll, microbial damage may affect the normal locks, especially if the cotton is left for an extended period under damp conditions on the field. (Figure 2) This microbial damage is an important component in the **weathering** of field cotton. The fungi commonly found in weathering cotton belong in large measure to only a few genera (Alternaria, Cladosporium, Diplodia); some of these are the same as found in tightlock. Figure 4 shows some of these fungi.

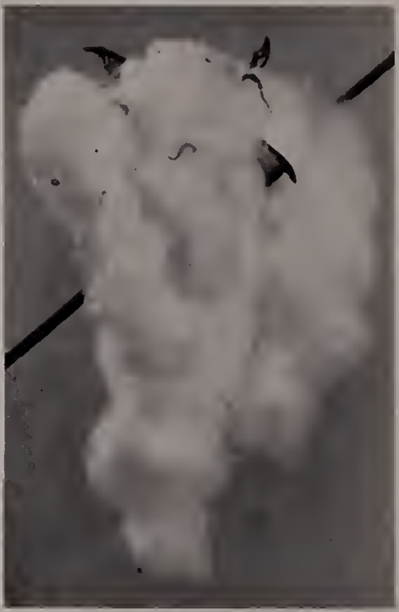

Figure 2. WEATHERED COTTON FROM EXPERIMENTAL FIELD IN CLEMSON. Various fungi developed during weathering; the fungi of Figure 4 were isolated from this sample.

Microbes in wet storage — Microbial activity is further considered to be the main or only cause of degradation of cotton in **wet storage.** This type of damage occurs if the cotton has not been sufficiently

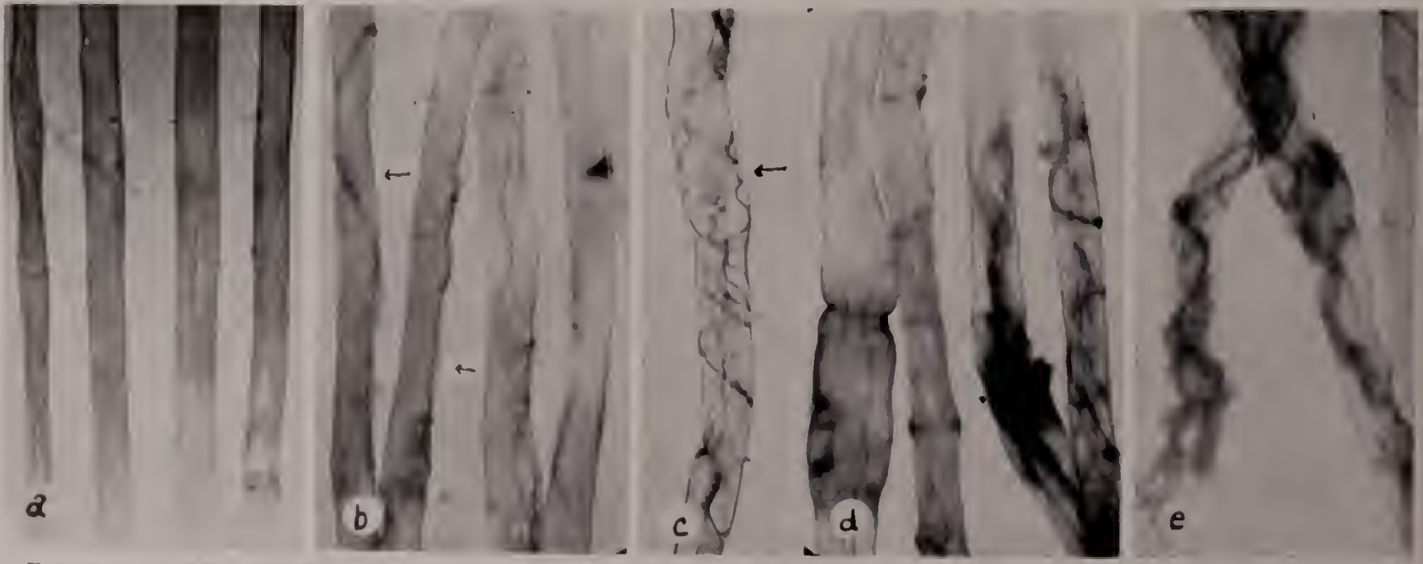

Figure 3. FUNGI ON MILDEWING COTTON. All fibers mounted in 18% sodium hydroxide. (a) Normal fiber; (b) Fungal hyphae growing on the outside of the fiber, in spiral (left) or laying on one side of the fiber (center) (c) Same in later stage, not spiraling of hyphae and localized ruptures of fiber. (d) Fibers are highly swollen (left) and severely damaged (right). (e) Final stage of deterioration. (345 X magnification)

dried previously to storage, or if it is stored in the warehouse under humid conditions. A moisture content of nine percent is generally considered the minimum for growth of microbes in cotton, although some authors report fiber damage progressing even at a moisture content of six to seven percent. During storage a great number of other fungi are active in addition to the above ones found in weathering (for instance, representatives of the genera, Aspergillus, Penicillium, Mucor, Chaetomium and Stachybotrys). These fungi are the same as those which cause the deterioration of cellulose fabrics, "mildewing". Photomicrograph 3 shows the hyphae of these fungi on the degrading fiber. Extensive lists of cellulose decomposing organisms have been published most of which have been compiled in the book by Siu.

Identification—The microbes discussed so far and mainly studied in the degradation of raw cotton are fungi or molds.

For the study, an identification of these fungi, small tufts of the cotton are incubated in a moist atmosphere, or suitable substrates are inoculated with a few fibers so that fructifications and spores will develop. Figure 4 are photomicrographs of some of the fungi obtained in this way from cotton weathered for a few days in experimental cotton fields at Clemson. The different types are readily recognized by the different shape and color of the spores and belong to the typical genera mentioned above.

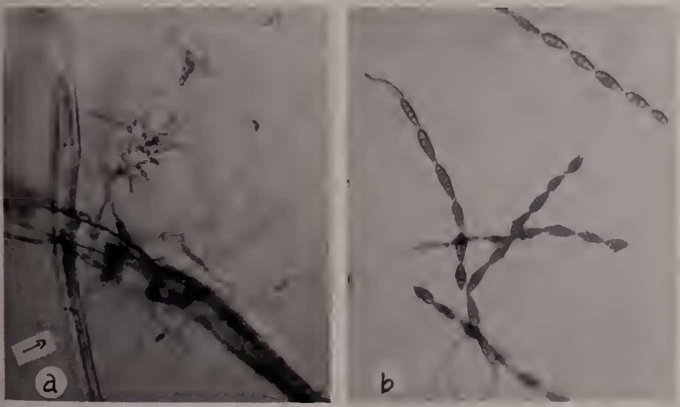

Figure 4. TYPES OF FUNGI GROWN FROM WEATHERED COTTON. Fructifications (conidia) of following fungi developed under humid conditions (fiber placed on 2% agar agar in Petri dish)

(a) **Cladosporium** sp., Note two cotton fibers, fungal hyphae and conidia. At arrow, hyphae are attached to fiber.

(b) **Alternaria** sp. Note string of dark colored conidia, each consisting of about four cells.

The type and structure of the conidia allows identification (250 X magnification)

The role of Bacteria — Bacteria and Actinomycetes have been often mentioned to play a part in the degradation of cotton but few actual data exists. Figure 5 shows bacteria outside and inside of the highly swollen locally damaged fiber.

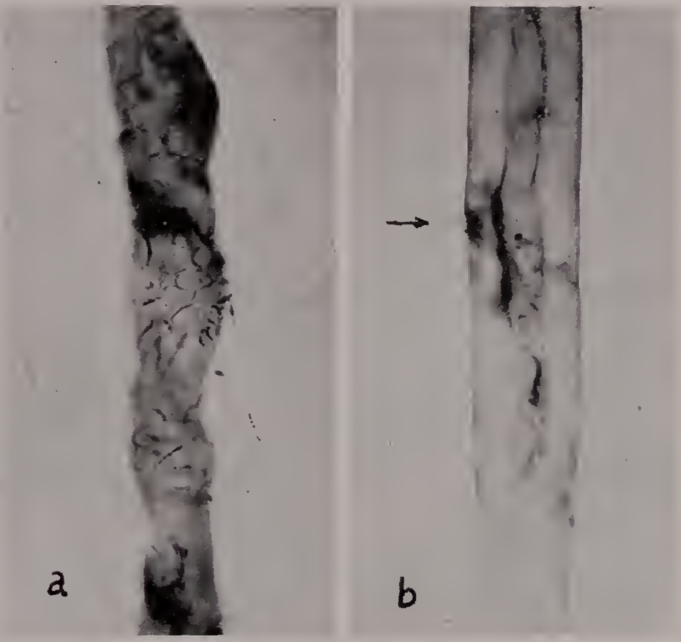

Figure 5. BACTERIA ON DETERIORATING FIBER.
(a) On the outside of the locally swollen fiber.
(b) In the lumen of the fiber, probably after penetrating at damaged spots indicated by arrow.

Mechanism of Deterioration — The biochemical mechanism of cellulose deterioration is not yet fully understood. The microbes can attack the fiber from the outside (Figure 3) or invade the lumen and attack the fiber from the inside. The biochemical decomposition takes place under the influence of one or more enzymes secreted by the organism. Various cellulolytic enzyme preparations have been recently obtained. Several hydrolytic enzymes are probably present in these preparations. One of the enzymes has been found to induce increased swelling of the fibers in alkali, (Figure 3d) other enzymes greatly reduce the strength.

2. EFFECTS OF MICROBIAL ACTION ON FIBER PROPERTIES

Effect on strength—The most important result of the activity of the above fungi is presumably the decomposition of cellulose and an accompanying decrease of fiber strength. The main technique for recognizing this effect consists in determining the reduction in strength of sterile strips of cotton **fabric** after incubation with pure cultures of the fungus in question. With this technique, the main fungi associated with tightlock, weathering and wet storage have indeed been found to be able of decomposing cellulose.

In the case of tightlock, serious deterioration of the fiber and complete loss of strength is beyond doubt and can be recognized even without measuring the strength.

In most other types of microbial deterioration, in weathered and cavitomic cotton, a decrease of strength has so far not been easily recognized. The reason of this lies probably in the localized nature of damage and the methods of testing. The Pressley tester, at small gage length which is customarily used for fiber strength determination, tends to mask the weak spots in the fibers. Only recently, a decrease of strength has been found in such cottons by using a 5 mm. gage length instead of the customary small gage length.

Effect on fiber length distribution—A decrease of fiber length is always found in cotton damaged by microbes. This decrease can be ascribed to breakage of the mold-weakened fibers during ginning and in the preparation of the sample for the Pressley test. That such breakage actually occurs follows also from direct observation. A comparison of length distribution e.g., in cavitomic cotton as compared to normal cotton of the same origin showed that the percentage of short fibers was much higher in the first cotton. It is this larger percentage of short fibers which probably causes the **lower spinning performance** of weathered and wet stored cotton. A loss of from 10-15% of the cotton in the form of exceptionally short fibers ("fly") may result. This is one of the most serious effects of microbial damage.

Effect on D. P.—A so-called "hidden" damage has been described in weathered cotton. Part of the cellulose molecules are broken in this case, as indicated by an increased fluidity (decreased viscosity) of the dissolved cellulose (lower degree of polymerization, D. P.). This damage exhibits itself by weakening of the fabric in later bleaching, finishing, and laundering.

Effect on color—A serious effect of weathering is **discoloration** of the fiber. The darkening of weathered cotton has since long been subject of accurate measurements since it seriously influences the grade. It has recently been directly ascribed to the presence of dark pigmented fungi on the fiber and processes have been worked out for bleaching such cotton.

"Cavitoma"—Another effect of microbial activity is a complex of mainly secondary characteristic changes in the properties of wet-stored cotton described under the name "cavitoma" (already frequently referred to.) It comprises a shorter staple, an increased pH, a decrease of reducing substances and an increase swelling of the fiber in 18% caustic (see Figure 3). These changes have been ascribed to microbial activity since the presence of certain fungi is associated with them. Cavitoma was originally considered to be characteristic for a certain type of damage during storage, distinguishing this from other types of microbial damage as in weathering and mildewing. Recently, similar changes have been reported, however, to be also associated with the growth of the fungi commonly found in weathering and mildewing.

Spots — During storage under humid conditions, spots of different color may result from the presence of large concentrations of mycelia and/or spores and conidia of colored fungi. Such color spots do not occur in dry-stored cotton, but may be abundant under conditions of excessive humidity. Other spots may result from oil, grease, marking-ink, etc. Fluorescent spots will be discussed under "detection of damage".

Processing performance—The behavior in processing has been extensively studied with cavitomic cotton. This cotton produces more processing waste, less even slivers, rovings and yarns, 45% more breakage in spinning and weaker yarns as compared with the same undamaged cottons.

(To be continued in next issue)

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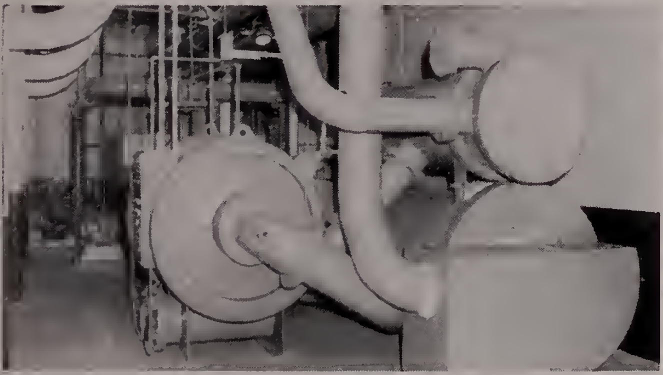

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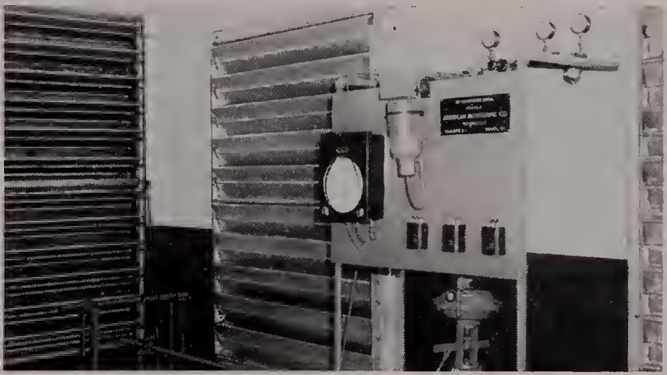

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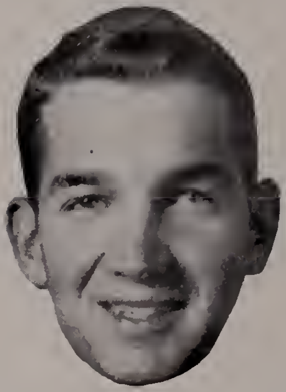
Lynn Arial Hendricks, Jr.—Lynn is a textile engigineering and mechanical engineering student and hails from West Columbia, S. C. Sports, particularly swimming, are favorite pastime activities enjoyed by Lynn.

Lynn made honors for three semesters, elected Who's Who and is a member of Phi Kappa Phi. He is also President of Blue Key, Floor Chairman of the C.D.A., Executive Officer of Scabbard and Blade, and a member of Phi Psi, Phi Eta Sigma, Arnold Air Society, Tiger Brotherhood, Pershing Rifles and Columbia-Clemson Club.

Plans for the future are filled with studies during the Summer and first semester next year in order to get the mechanical engineering degree, and then three years with the Air Force followed by a career in Textiles or in the field of mechanical engineering.



William R. O'Dell—Billy is a textile manufacturing student from Newnan, Ga. As hobbies, Billy likes to hunt and watch athletic events. Billy is attending Clemson on an athletic scholarship. He was named on the All-Conference Football Team (U.P.), All-Conference Scholastic Football Team and received honorable mention on the All American Scholastic Team. He also is a member of the Block "C" Club.

During the summers, Billy has worked with the Textile Division of U. S. Rubber Company. Bill's plans for the future are not definite but he will either enter the textile field or go into the coaching field.

Kenneth Carlisle McAlister, Jr.—Kenneth is known better by his nickname, "K. C.". He is a textile engineering major and makes his home in Anderson, S. C. His favorite pastime is playing around with art in the form of oils and water color painting.

He is a member of Phi Psi Fraternity, the Senior Platoon, and holds the rank of Lieutenant in the Air Force ROTC.

During the summers, "K. C." has worked at Equinox Mill in Anderson. While at Equinox he has worked in the weave room, twisting room, card room, spinning room and shipping department.

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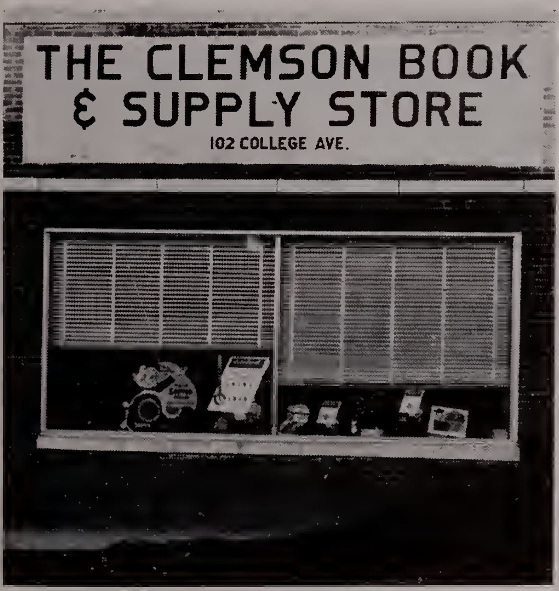

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Office Notes

By Emil Stahl, Editor

This being the last issue which the current staff will publish, we would like to thank the members of the faculty and those guest writers who have had their articles published during the past year. Without their help, it would have been impossible to have this publication.

It is my sincere hope that those issues which we have published have been of interest to the students of the Textile School and also those already in the industry. It would be a rather difficult task to attempt to cover all the various phases of the industry in our limited magazine, but we have tried to keep our readers abreast with the current developments in the industry that have proven to be of interest.

I would also like to thank our advertisers, without whose help the free distribution of this magazine would not be possible. Their continued support is sincerely appreciated.

I would wish that the new staff have as much cooperation and that they may continue to uphold the high standards and policies of THE BOBBIN & BEAKER.

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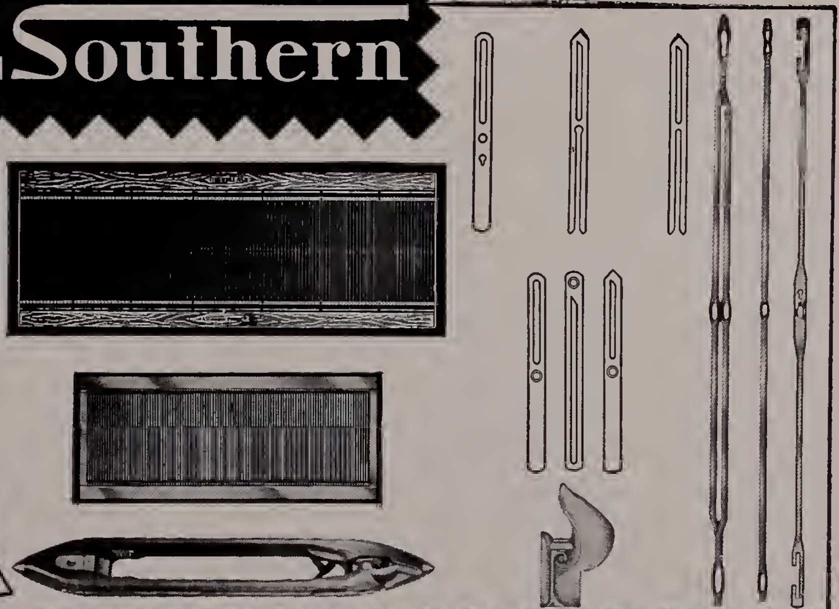

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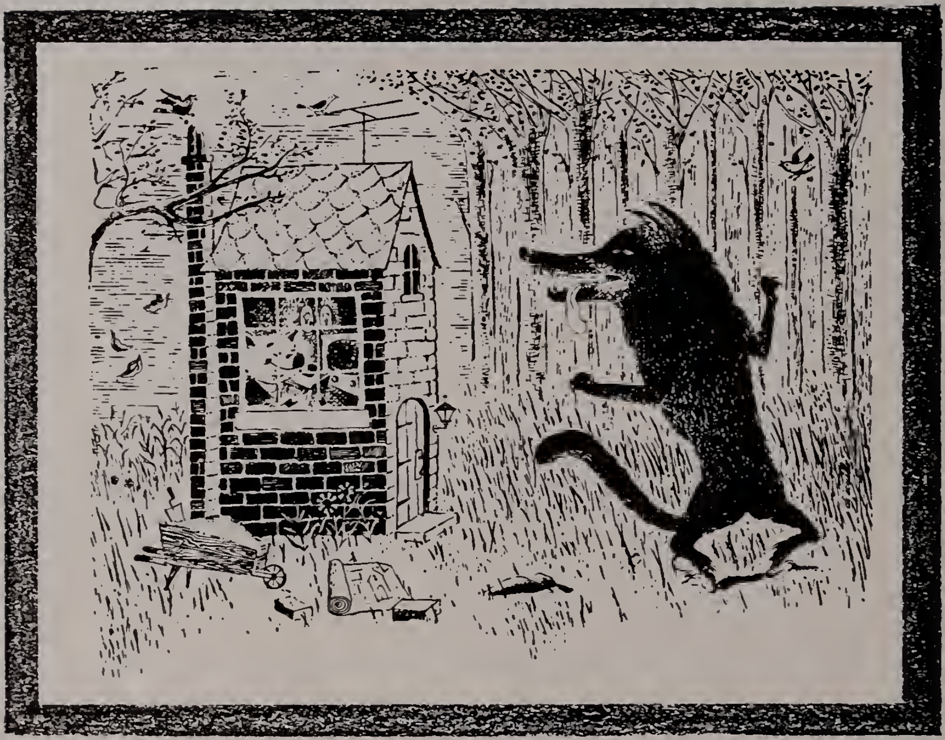

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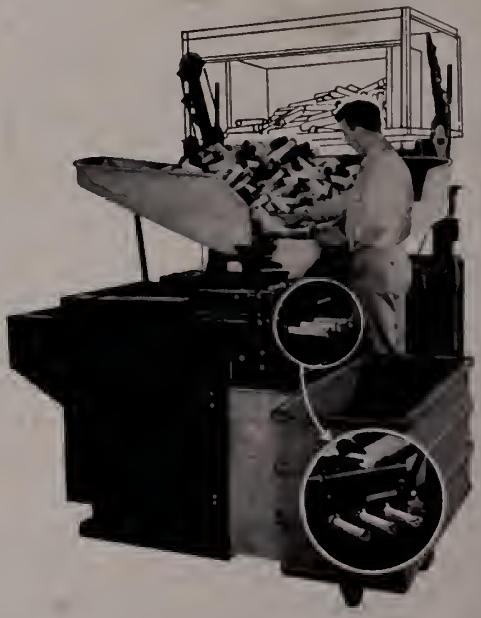

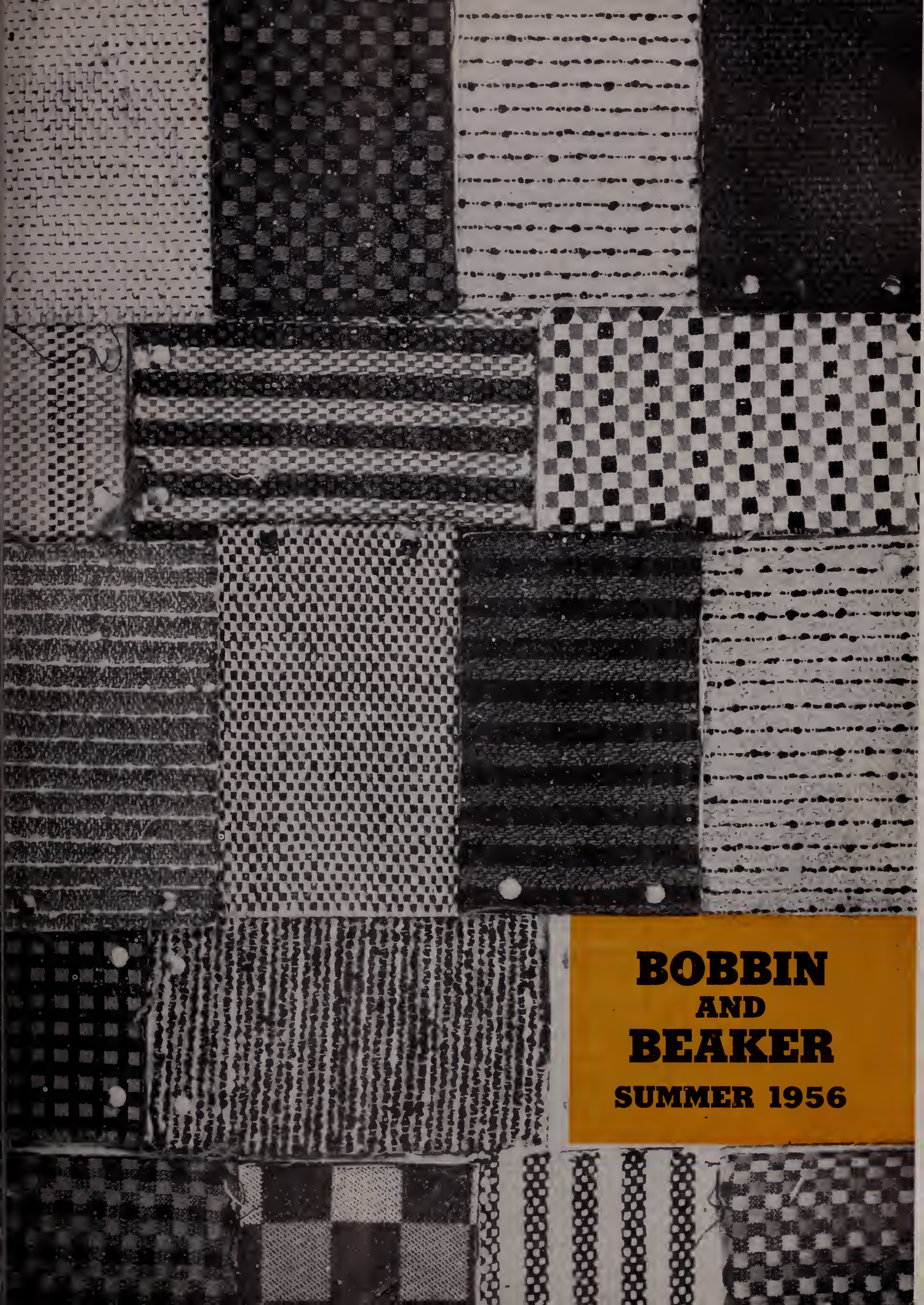

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THE COVER:
By TED PAPPAS '57

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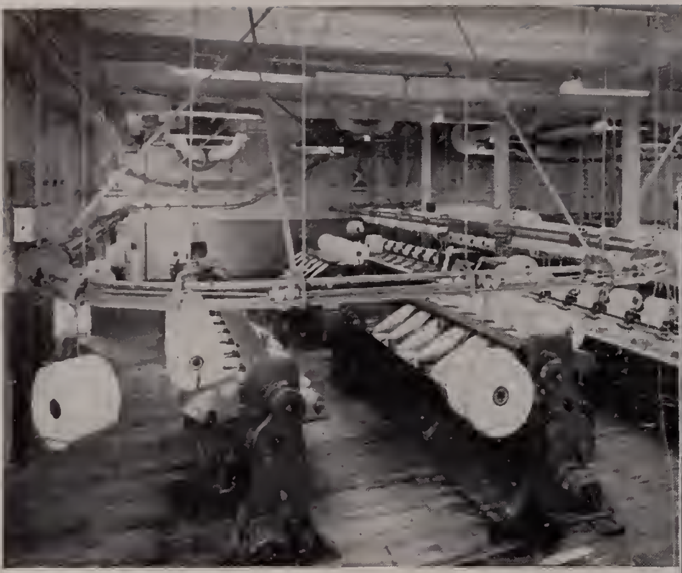

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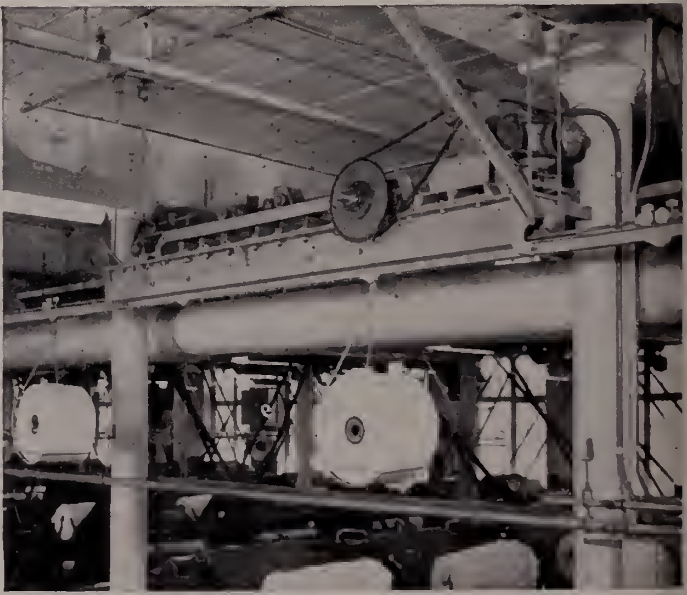

Caterpillar drive brings dogs in pairs mounted on endless roller chain down to engage the Landahl trolley housings for forward propulsion.

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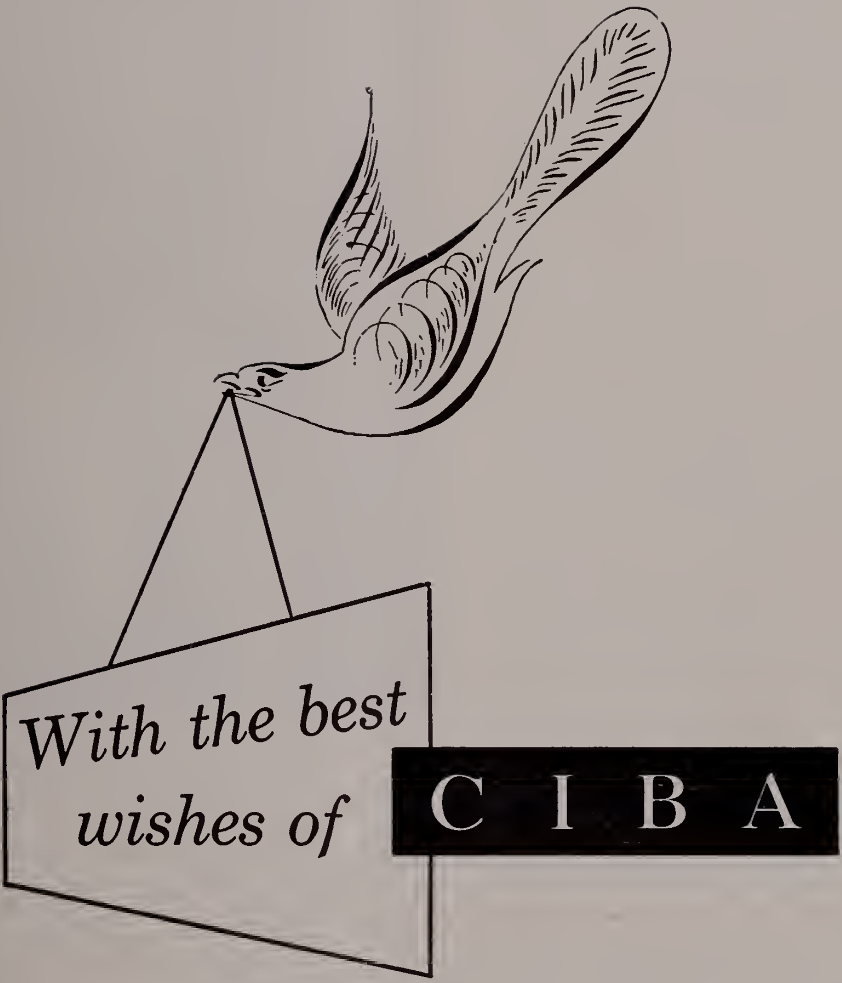

With the best wishes of CIBA

Significance In Quality Of Textiles

W. H. Esslinger, Quality Coordinator
Central Manufacturing Division
M. Lowenstein and Sons, Inc.

The quality of cloth made will be the variable upon which economic success in textile manufacturing depends. So, in view of the significance of quality, a study has been made to determined the best methods in the control of it and also to determine in what way statistics can be used. Statistics as we use them here refers to a body of methods by which useful conclusions can be drawn from numerical data.

Textiles is one of the oldest and most competitive in America today. It does not enjoy a protected position or opportunity profits resulting from patents, or secret processes. Their basic production, cotton, is in itself a very complicated product, graded and sold on a highly stabilized world market.

The first two, cost and production, are relatively stable; one, because of the statue of the price of cotton; second, because all favorable changes resulting from new processes, or mechanical inventions are quickly adopted by all companies with the industry.

Therefore, if cost and production can be predicted for a given market, then one might ask on what basis does the industry compete among themselves. Quality is the only item left for competition. Their customers compare the variation in the quality of their product. With the supply, demand and price relatively fixed at a given time, the buyers will buy from that company having the best quality on the market.

Quality is the only variable that is unstable. The success of a company in maintaining or improving its position on the market will depend on their ability to control the quality of their cloth. To insure their accomplishing this control, men, materials, and machinery, as well as methods, must be constantly regulated or changed to produce the utmost quality without sacrificing the predetermined estimate of cost and production.

Textile companies, realizing the very important role quality plays in their success, have set up quality control departments as a check and an aid to assist them in obtaining their goals. They must make sure that their quality is equal to or better than their competitors.

The significance of quality covers so many different phases of a company's activities that to do a proper job in discussing it, it requires that it be broken down into many different subjects. A few of them are presented here.

After first realizing the big problem confronting them in quality, and just how much it means to them in obtaining and controlling it, they should consider the cost of off quality. They grade their product and class it into several classifications. Each class has a lower grade and lower value after first quality. The value decreases as follows:

First quality = 100% of first quality
Second quality = 95% of first quality
10/40's = 92% of first quality
1/10's = 75% of first quality
lb. goods = 50% of first quality

On a market, the difference between a profit and a loss is often determined by their ability to hold their off goods to an absolute minimum.

Since production and cost are relatively stable, the quality is their variable. This being true, their customers have to pay everybody the same price, so naturally they want the best quality they can get for their money. Quality is their deciding factor in making a purchase. Should a company's quality fall below that of their competitors, either through ignorance or laxness on their part ,they immediately are in danger of losing an account.

Not only do they lose one account, but soon this news will spread and they will have established a bad quality reputation. Then their salesmen have a very difficult task in selling their cloth.

By the same manner, a good quality reputation can be established and the selling of their cloth is much easier. A good quality always has the favorable position on the market.

Many companies spend a considerable amount of time checking, comparing and studying different methods and processes, always trying to improve quality. They are constantly asking their quality control departments for comparisons between their production and other companies'. They ask their selling agents and finishing plants for comparisons and criticisms on their production. To be able to do a good job quality wise, they must first know what a good job is. The only way to be sure of this is to compare and check constantly. They must try to benefit from other peoples experiences. To be able to do this, they must know what they are doing, what the other fellow is doing and if they can do it better than the competition.

What causes off quality? Off quality is just what the name implies—defective cloth, a lower quality than that considered as first. This is usually caused by either off cotton, machinery failure, or the human element. Poor quality cotton containing immature fibers causes what we call neps. They are small white spots or tufts which under a microscope are entanglements of immature fibers. In the finishing and dyeing of the cloth, these neps absorb or react to the dye differently. In certain instances after the cloth has been dyed, the neps will move or leave white undyed spots. Excesively dirty cotton or insufficient cleaning of it, leaves us with an inferior piece of cloth. Cotton containing too much short staple lowers our breaking strength.

The yarn and weaving defects caused by machinery failure are much too numerous to go into detail. However, a few of the major machinery failures are choked spinning rolls causing uneven yarn, loom smashes, group floats or pick outs caused by mat ups in the warp yarn on the loom and jerked in filling on the transfer.

Off quality caused by the human element is perhaps just as costly as the other two. Some of these are wrong draws, double ends, reeds bent by the weavers hook, excesive amounts of oil put on the loom bearing or hanger bearing and loom cleaners blowing foreign matter into the cloth as it is being woven.

Grading of cloth. This is one of the most important of cloth room functions. It is one point in their operation where they retain good relations with their customers or lose them. Their customers care nothing whatsoever about how much trouble or how costly it is for them to make cloth. He is interested only in what the quality is when he receives it. However, we all know it is impossible to make a perfect piece of cloth, so they have set up a standard or a grading

(Continued on page 26)

Engineers Keeping Pace With Industry's Demand

By E. J. McVey

Vice President, Saco-Lowell Shops

As the cost equation containing the various factors involved in the evaluation of mill operations becomes more and more complicated with the passage of time, the task of the textile machinery manufacturer who is conscious of his responsibilities to his clients becomes more and more complicated.

First of all, there is that law of economics, the law of diminishing returns, which confronts him on the one hand; the demands for the maintenance of quality on the other; while around the circumference of his efforts are the complications arising from the complexity of the raw materials now generally used in the production of all kinds of fabrics; for industrial goods, for wearing apparel, household furnishings, and containers.

The designing engineer seeking to produce machinery which will improve the operations and quality in the mills of his clients must solve the difficult problems developed by these basic factors. Naturally no mill is interested in making yarns or cloths which they cannot successfully market on account of poor quality or high costs; and for this reason, before the responsible machinery manufacturer can release a new product for general distribution throughout the industry, the new equipment must be completely proven, to the most minute detail, by exhaustive tests in first, the shop laboratory, and then in several production stages.

This kind of testing, involving many redesigns of construction, and numerous changes in the materials and finishes used, is truly a costly process, both in regards to capital expenditure, in engineering man hours, and in the consumption of the raw material.

Many mills do not appreciate these facts and are therefore prone to often criticize their machinery supplier when he refuses to release equipment which is not completely tested and proven.

When the machinery manufacturer, under pressure from his friends and clients, the mill executive, does release this equipment prematurely, there is always a tough period of time when the mill operating staff and the engineers of the manufacturer must seek out the factors in design or material which are the root of the trouble; these efforts are always productive of unnecesary costly expenditures, to the detriment of all concerned.

We have gone to some length to point out these conditions because many of the mill executives are quite conscious of the great developments being made through the application of electronics, through "automation" in many fields, and are pushing their machinery supplier to adopt some form of "automation" in the mill in order to either increase the efficiency of the individual machine, or to increase the production per man hour, or to improve the quality of the yarn and cloth.

Many times these ideas possess a degree of merit, but often the application, upon a careful analysis, has so many hidden sources of trouble that all that can be done is to put it in the file for future reference.

At this time we now affirm that the engineers and designers of the shops have not been unaware of the miracles of this wonderful era in which we are living; and to prove this, it now becomes our privilege to point out how we have, in the last few years, brought "automation to the yarn spinning industry, even though the equipment does not carry a crown of electronic tubes, resistors, solenoids, and similar tools used by the electronic engineer, but only those tried and tested assemblies which can easily be understood by the average mill maintenance staff, and which is so rugged and dependable that it can stay in operation week after week without more than routine cleaning and inspection.

The average mill when buying new equipment expects from this new production tool the ability to earn a high return on the investment, and if the new machinery required a staff of electronic experts to keep the production upon an efficient basis, this anticipated amortization would be impossible to attain.

The above explanation brings us to a discussion of "automation" in the cotton spinning industry as it has possibily cleared up some of the difficulties confronting research in this field.

As we have pointed out in the past, the term "automation" has been used rather loosely in all of the industrial arts. Therefore, for our purpose we will define "automation' 'as a means or system for making a better yarn with an increase in the production per man hour. This increase in the production per man hour naturally develops through the elimination of some process on account of a better preparation, or through the increase in the production of the several production units, or through a decrease in the frequency with which the stock in production must be handled. It is now that we can take a look at what has been accomplished by this kind of "automation" in the last decade or less.

In the modern picker room, after the stock, whether it be cotton or synthetic, has been placed in the primary feeder, it is never again touched by the operative until the lap is doffed. All of the primary feeders, the intermediate opening and cleaning machines, the overflow box and distributors, and then the controlled feed chutes are all operated by a system of synchronized control which keeps the stock flowing evenly at a predetermined rate through the system.

For a concrete example of what this "automation" has accomplished in this particular department of the yarn spinning mill, assume that there are six pickers making a total of 2100 pounds of laps per hour. In the mill which is properly staffed, this poundage will be handled by a section supervisor who will do the oiling and fixing, and two machine tenders—attaining a production rate of 700 pounds per hour.

It is doubtful if a better example of practical "automation" can be found in any industry handling similar raw material and with the same quality requirements. These machines normally operate at better than 90 pct. efficiency, and we expect to do better than this when our new picker calander is ready for production in the early future. This new calander will enable the mill to produce laps weighing over 80 pounds—almost twice the weight of the average lap in general use today.

As an added advantage to the controlled operation of the modern picker room is the better preparation of the stock delivered to the card room; it is cleaner with stronger fibers and more uniformly sheeted than ever before. It is not unusual for the lap to contain better than 95 pct. of the yardage within the close tolerances demanded by the quality controls in use at this time.

The improvement in the production per man hour in the card room has been one of the major accomplishments of the industry. It was not many years ago when three process drawing, two and three process roving, the use of 10" and 12" cans were considered as standard and accepted practices. Those manufacturers seeking the ultimate in quality were convinced that the doublings created by these multistage processes were completely essential and a prime necessity to secure uniformity in the yarns of a degree which would satisfy the prevailing standards.

Our type of "automation" has brought about a complete change in both the thinking and practice, and at the same time has been the source of bringing about a definite improvement in the quality of the ultimate yarn. 14" and 15" cans, some measuring 42" long ,at the card, drawing, and in back of the slubber has reduced the effort expended in material handling between processes as much as 50 pct., and in some cases more.

The increased use of the 12"x6-1/2" slubber, and the resulting advantages, has made the 8" x 4" frame obsolete, and the 10" x 5" semi-obsolete, except in special cases where it is necessary to produce rovings finer than 1.25 hank. In other words, the ambitions and progressive mill can now meet almost any production requirment with but two sizes of roving frames; the 12" x 6-1/2" for rovings to 1.25 or 1.50 hank; the 10" x 5" for those as high as 3.00 hank to 4.00 hank.

With the long drafts now practical in spinning, no mill in producing the ordinary commercial counts should be called upon to make finer rovings. Naturally, these large creel packages, long drafts, and large bobbins reduce the cost of material handling, improve the overall operation of the card reduce the amount of costly reworkable waste, all with a definite improvement in the uniformity of the strand and its spinning qualities and characteristics.

To give a concrete idea as to what this "automation" has already accomplished in the card room, we should recall that no longer ago than 1936 to produce 1200 pounds of roving for print cloth numbers, the card room installation would consist of a total of 13,000 slubber, intermediate ,and fine frame spindles; the same work today is accomplished by using 14 slubbers, 80 spindles each, a total of 1120 spindles,

(Continued on page 26)

Causes and Detection of Damage in Raw Cotton II

By A. N. J. Heyn

Professor of Natural and Synthetic Fibers
School of Textiles, Clemson College, S. C.

In a previous article, the causes and effects of microbial damage of cotton have been discussed. The present article deals with some other causes of damage of raw cotton, namely, chemical, mechanical and heat damage.

1. CHEMICAL DAMAGE

Chemical damage mainly occurs in the dyeing and finishing process, but in a few cases may also be cause in raw cotton, namely during weathering, where photochemical damage and honey dew may affect the fiber; and in transportation, where different substances like tar and oil may cause contamination.

Photochemical damage. During weathering, photochemical degradation of the fiber may be caused by exposure to sunlight. This effect consists in a breaking down of the cellulose molecules, as can be shown by the lower viscosity of the dissolved cellulose. This molecular breakdown results in a "hidden" damage which is not directly observed but, which exhibits itself later on by a weakening of the fabric upon bleaching, finishing and laundering. Only little work has been done about this type of damage.

Tar and Oil Spots. A completely different type of chemical damage is caused by the presence of tar and oil spots. The tar spots are mainly found on the outside of the bale but in certain cases, also occur in the inside. If the spotted cotton is not removed, the tar will spread during the manufacturing process and the finished fabric will show numerous small black spots. High temperature favors this spreading. This annoying type of damage has caused a great deal of trouble and financial loss and is recently flaring up again after a temporary recess. Most mills carefully check the bales for tar and often remove the entire outside layer if contamination is suspected.

The importance of this problem in South Carolina became clear from the author's survey which showed that twenty of the thirty mills contacted, reported trouble with tar spots.

The National Cotton Council has investigated the sources and origin of tar spots and found that they may result from various causes such as picking bags preserved with tar, contaminated railroad cars, asphalt from roads, tarred bale bands, etc. Oil spots often originate from the bale press. An educational program by the National Cotton Council has already resulted in a considerable reduction of the evil.

The Cotton Council has also investigated possibilities for reducing the damage by improved wrappings. The American cotton bale has the worst wrapping of any cotton bale in the world, and most of the complaints about exported American cotton pertain to this shortcoming. Experiments are being conducted at present with diverse new wrapping such as unwoven cotton, synthetic fibers (polyethelene), cardboard, etc. Promising results have been obtained which may soon revolutionize the packing methods.

The Institute of Textile Technology has made a different approach and has worked out methods for easy removal of the spots in the finishing of the cloth. This spotting process, however, is time consuming and involves extra costs.

Honeydew is a chemical defect of lesser importance. It is caused by the presence of sugar secreted by certain insects, namely Aphids (Aphis Gossypii). Special types of dark pigmented fungi (Cladosporium) generally develop in this gummy product. The stickiness of such cotton causes difficulties in processing. Simple chemical tests exist for recognizing this type of damage. They will be described in the next article.

A great deal of interest exists at present in **fluorescent spots** due to the presence of certain substances which show fluorescence in ultra-violet light. A discussion of these interesting spots will be given in the next article.

2. MECHANICAL DAMAGE

In almost all stages of mechanical picking, ginning and manufacturing greater or smaller mechanical damage is caused to the fiber.

This damage not only consists of a breaking down, bruising and crushing of the coarser structure of the fiber but also affects the fine structure of the fiber by breaking the molecular chains down. The first type of breakdown is recognized by microscopic examination; the latter by a lower viscosity of the dissolved cellulose. In the extreme case, a complete break of the fiber and a corresponding reduction of the fiber length may occur.

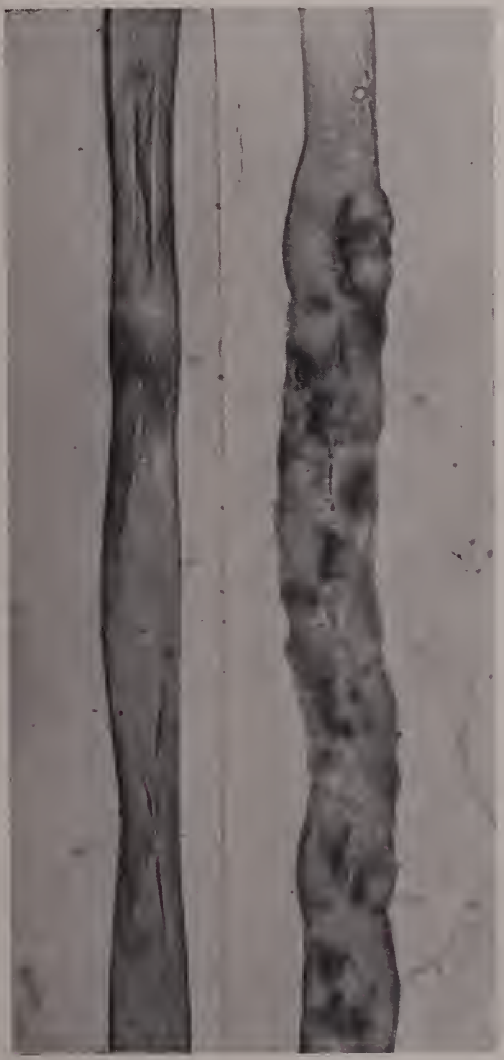

FIGURE 1. MECHANICAL DAMAGE IN COTTON

a, normal fiber; b, damaged fiber. Both are mounted in sodium hydroxide after staining with congo red.

Note crushed places of darker color, and the higher swelling of the damaged fiber in b. Only the upper part of the fiber in b is not damaged.

In the normal ginning process, a reduction of the original fiber length of the seed cotton **always** occurs and is revealed in the fiber length distribution curves by a decrease of the average length and an increase of the number of shorter fibers. Moisture, temperature and the mechanical conditions of ginning greatly influence the effect and the degree of damage which accompanies it. An 18 percent decrease of the degree of polymerization (D.P.) of the cellulose has been found to occur in normal ginning. In all mechanical operations of the cotton manufacturing process together, a total decrease of 30 percent has been found. (The greatest decrease (in D. P.) occurs during the picker operation.).

A special type of mechanical damage, which is due to faulty ginning, is the formation of an excessively high amount of **seed coat fragments,** small parts of the seeds, chipped off by the saws. The seed coat fragment, themselves, give rise to black spots in the yarn and in the cloth, whereas the immature fibers attached to them may cause certain types of neps of inferior dyeability.

3. HEAT DAMAGE

Heat degradation of cotton is particularly important in finishing and laundering of fabrics and in tire cords and has been extensively studied in these materials. It has been generally recognized that until 100 degrees C. degradation damage is not appreciable, but that it rapidly increases above this temperature.

A simultaneous **reduction** in strength and elongation of the single fiber has been found at temperatures from 110 degrees C. till 162 degrees C. The heat effect consists in the creating and intensifying of weak spots along the fiber. An increase of the number of transverse cracks can be directly demonstrated under the microscope. A decrease of the degree of polymerization of the cellulose also occurs. The percentage of cellulose chains broken is at the beginning linear proportional to the time of heat exposure. Moisture accelerates the process.

Heat damage plays a most important role in the **drying prior to ginning.** So-called **"overdrying"** causes considerable damage to the raw fiber. The effect on overdrying on the fiber properties, as studied with the customary methods for fiber quality testing, mainly consist of a shift in the fiber length distribution towards shorter fibers. The shift has a serious effect on the **processing performance:** the breakage in spinning is 21.4 percent higher with over-

(Continued on page 19)

These Things Get The Job Done For Me

By Ernest W. Fair

The following article appeared in the March issue of the TEXTILE WORLD and is reprinted with their permission. This article should be very helpful and interesting to the textile students especially the graduating class.

The biggest job of every supervisor is getting and keeping the wholehearted cooperation of the men and women under his direction. If employees go along with your ideas and plans and schedules, your department gets more and better work done than any amount of driving and pressure can ever accomplish.

Most successful supervisors develop their own pet methods of getting maximum results from their employees. Recently 25 of them were asked how they go about getting the job done. Here are their answers.

"My job is to get things done through people, and I never let myself forget it. Every step I take is planned toward that goal. The hardest thing I had to learn was that I was not a ringmaster or watchdog over the people in my department. When this clear understanding of my real role as a supervisor came to me, I got better results and my work was made a lot easier."

"The most important thing that has helped me get more done in my department is a rule of my own to make sure that every man gets full credit for any job well done. I've found that the surest way to discourage initiative and extra effort in my people is to overlook such things. Even where we have a bonus for such work, I've found the men are just as eager for recognition of what they have done as they are for that bonus."

"I try to lead rather than force my people to do the job. Whenever a difficult job comes up, I've found it cleared away much faster when I stepped in and took the lead instead of pointing it out and telling the men to get the job done themselves. Any given job always gets done in far less time than under the old method."

"The biggest thing I've learned is that you have to be constantly on guard against hurting any employee's pride. Sure you can hire the kind of people who have little pride and are never affected by anything you may do; but they're not the kind of employees who make any supervisor's job easier for him. Pride is a mighty important ingredient in any worth-while worker. Guard it with care and caution."

"The most important thing I do to keep my department operating smoothly is that I keep studying each man and woman to make sure what particular incentives affect that individual the most. I doubt there are any two alike. When I've found the one thing that gets top results from any individual, then I know how to handle that employee. It sometimes takes several weeks to discover what it is, but after that there's a lot of smooth sailing."

"One thing I've found mighty important is to explain everything. Just telling a man to do something or taking it for granted that he understands all about the problem causes a lot of extra work afterwards and sometimes costly slowdowns."

"I set the example I want them to follow. No department in any company is any better than the example set by the supervisor. If he takes a sloppy attitude towards the job, his people can't help but follow suit. If he sets an example of initiative, love of his work, interest in every job, etc., his people will follow suit."

"I've found the most important single thing is to be extra careful of what you say and how you say it. When you do that, your words will mean something to the people you're talking to; and you cut down posibilities for misunderstandings and mistakes."

"My chief policy is to promote a competitive spirit among the workers in my department. Competition makes for better results, even if it's nothing more than to see who can keep his work the cleanest, make the fewest mistakes, or some other element strictly among the workers themselves. One word of caution: make sure it's not belligerant competition."

"To me it's most important that a supervisor learn to be a good listener instead of completely dominating every conversation he has on the job with the people under him. When you're a good listener, you draw your workers out—get them to thinking more about the work, developing their own ideas, and taking a greater personal interest in the job."

"The big thing is keeping a smooth-running operation. I've found one sure way to do it is to bend over backwards to avoid playing favorite. Then every employee works better with the other fellow on the job."

"I try to locate troubles before they break out. Just about 25 percent of my time is spent that way. Experience has taught me it's a lot easier to stop something before it comes to the surface than to clean up after it has boiled over."

"I always keep a favorable attitude toward the company. What gripes I have against the front office I keep to myself. I've noticed that where supervisors air their dislikes in front of their workers, the efficiency drops right there and soon the whole group is doing the same thing."

"Patience is the greatest asset any supervisor can have in handling any man or any problem. Until he learns patience, he can't call himself a good foreman. With it, you never make snap judgments."

"The toughest job any supervisor ever faces is in disciplining one of the employees under him. It's a point at which he can start a chain re-action that will lead to an explosion of future trouble for him. I make sure I have all the facts before I ever discipline any employee. That's kept me from making mistakes that could have disrupted my whole department later on."

"My pet method of getting the job done is to find every opportunity I can to praise individual employees for their work. It works wonders. But it can be dangerous if it's overdone. You have to learn the proper balance and stick to it."

"I'm careful to avoid prejudice against any individual employee. If he or she has feelings, traits, or actions I dislike, I ignore them completely as long as that individual does a good job. I've seen too many cases where supervisors let prejudices against certain employees ruin all the other good things they have done and completely mess up their departments."

"To me one of the most important things you can do is never overlook an opportunity to build up a man's job in his own estimation. The man who is proud of his job always does more for you with less trouble."

"I keep building on each employee's future with the company. I've found the people under me have to have goals toward which to work hard; without them, they never have the incentive to do anything extra. I never overlook an opportunity to give them something to work for."

"A supervisor has to dish out criticism; that's one of the reasons he's in his job. But I've found there are two ways to do it—constructively or destructively. Whenever I criticize an employee, I do it constructively; and I've always had good results with this approach."

"Show an interest in and appreciation of an employee's work; that makes him a better man and easier to handle. If you confine your efforts to keeping him working ,he'll use every dodge he can think of to keep from doing anything extra."

"My pet rule is to always discuss every job problem with the workers involved. Following it has done more for me in my department than anything else I've ever tried to do. You get more willingness to do something extra from your people when they have a chance to help you work things out."

"One of my pet methods is to give my employees things to work up on their own. That keeps them from being mere machines. It keeps them alert. It gives them something extra when they have to think out a problem all by themselves during an emergency."

"I carefully avoid making promises that I may not be able to fulfill. I've found that unkept promises are a bigger source of resentment by employees against their supervisors than anything else. When it involves the company, I make sure first it will be delivered before I promise my workers anything."

Textiles as a Career

D. P. Thomson

Associate Professor of Yarn Manufacturing
Clemson College

Many of you perhaps think that you know what a textile career would be—just running machines in a mill.

But that is only one of its many sides—the textile industry is broad, it's basic. It does make cloth from raw materials, but it does a lot more—there are many kinds of cloth, from sheer nylon to coarse industrial ducks.

All the tints and hues of the rainbow are imparted to the finished product. Finishes of all types are added. The product is bleached, is made into clothes, yarn is knitted into socks and underwear.

Special fabrics to meet special needs are developed. Different fibers are blended to impart their special characteristics to the finished whole.

Today, fabrics are engineered, not just made. New fibers come into being, new and less costly methods are devised. More beautiful fabrics are still in the test tube.

To an industry that has duplicated the work of the worm, the wool of the sheep and developed new and unheard of fibers of its own, very few things are impossible.

Over a million workers are teamed together to accomplish this gigantic task of clothing the nation and supplying industry with its textile needs.

One of the most important steps that a young man takes is that of choosing a career. It's not easy—his whole future and happiness may depend upon how and where he makes his living. Before making the final decision for your life's work we would like for you to seriously consider a career in the textile field. This industry ranks second in the nation—80% of it in the South and about 30% in the state of South Carolina. Consider all sides of the problem. What will the pay be — not only now, but later — what chances are open for advancement—under what conditions will I work — what security do I have — where will I be able to obtain employment — near home — in the South or will I have to pull up roots and move to another part of the country.

A CHALLENGE TO THE TEXTILE INDUSTRY

There are ten schools that offer textiles as a major course of study. Over the past four years there has been a decline of about one hundred per year who are majoring in this field. From slightly over 2700 in 1952, to 2500+ in 1954 to 2300 in 1956.

The above figures are enrollment only and are subject to casualties as the student progresses. Most of these courses are for a period of four years. So only about 400-500 are graduated each year. A lot of these are absorbed by allied fields so only a part of the graduates are available for the textile mill exclusively.

The armed services also takes its toll at least temporarily and a conservative estimate would be about 50%. Some of these absorbed into the military services are permanently lost to the industry.

Chronological advances make the college trained men more desirable and the one with a textile background even more so.

There are about 1300 plants in competition for these few graduates and with a decreasing supply against an increasing demand, where are your future executives and production men to come from.

Recruits for the industry for college training must come from the high school level. After the student has started one field of study, it is difficult and costly to change.

The men of the textile industry can be of help to us and to themselves if they will help tell the advantages of the textile industry to likely high school students.

It is very hard for the young high school student to get a proper perspective of our industry from the outside. We are also in competition with the so-called glamour industries that tend to fire the imagination of the immature student.

A brochure has been developed here at Clemson to help tell the story of textiles to the high school students. If you would like one or several to be used for this purpose, please return the form below.

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Clemson, South Carolina

Please send me ——— copies of the textile brochure for distribution to prospective textile students.

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What Industry Wants From a College Graduate

Edgar Davis, Jr.

Personnel Director
Abney Mills

Recently a young man, a graduate of Clemson College, who had just finished several years of service with the armed forces, came into my office looking for employment. He filled out a routine application blank, and then we talked about his college background ,his experience in service, and the line of work in which he was interested. He had brought along a transcript of his record at college and before showing it to me apologized, saying that he was ashamed now not to be able to present to me a record of higher marks in his classes.

Too often young men in college do not recognize the importance of making high grades. Frequently, no doubt, they have heard successful men in business say that getting along with people is the main thing and that marks on subject matter earned during their period of college training are of minor consideration.

Although it is definitely true that failures to make a success after one's college career are most often due to a person's inability to adapt himself satisfactorily to the people to whom he is responsible and with whom he has to live during his working hours, an applicant for employment always receives special consideration if the college record he has made in his classes is outstanding.

For to the person who is charged with the responsibility for employing personnel the high marks made during the applicant's college years are an indication that this person not only has an alert and inquiring mind but that he has already proved he is capable of self-discipline in the matter of work, that he has actually put forth considerable effort to do the best job he can, and that he can be depended upon to do what he is expected to do.

As one successful business executive put it, he likes to work with people who have already learned how to work. He says it's like playing a round of golf, "When I pick someone to play golf with me, I'd rather play with someone who is not a rank amateur but a person who can come close to par for the course."

The charge of being a bookworm that is so frequently aimed at college men who finish with honors is as out-of-date as the Model T Ford. You will find that the honor graduates of your school are much sought after by business and industry, that they are able to command the best starting salaries, because of the simple fact that if an employer needs an engineer, he wants one who already knows his theory, not one who has to learn it after he is placed on the job.

So much for a person's grades during his college years, for they alone are not the clue to a person's success in business and industry.

A man's capacity for leadership is perhaps of prime importance. And this quality of leadership is exceedingly difficult to find. Everyone wants the high salary which goes with responsibility, but there are few who are willing to accept the work and worry and strain which a top executive must bear. And many men just out of college forget that the best training for leadership comes through humility and the willingness to learn by experience at lower levels.

Several days ago I saw a cartoon in a pamphlet which came across my desk which showed a young man with a college diploma applying for a position with a large company. The personnel director was quoted as saying, "I'll check to make sure, but I don't believe we have any openings on the board of directors."

It is a mistake, then, for a college graduate to expect to start too high up on the ladder. He need not fear that by starting as a modest salary and at a non-supervisory position that, if he shows real ability, he will be overlooked by his employer, for men who have the essential qualities of leadership and who are capable of earning positions of trust and responsibility are too hard to find.

Recently I asked the president of a large corporation what his advice would be to a college graduate coming to work for his company, and he said, "Tell him to be humble." No one is going to be deceived into thinking that the outstanding college graduate knows all the answers. For an education can be obtained in more ways than by going to college, and the business executive knows that a man's college training is only the beginning of learning.

A young man is fortunate if he has learned in college that at the very best a man can learn only a few things in a whole lifetime, but that he **can** learn. And a store of technical knowledge is not enough. A college graduate should have learned that a closed mind is a handicap, that he must be able to think for himself, to read critically, and to make decisions based on fundamental principles. He should understand why freedom is to be preferred to authoritarianism, that the achievement of human dignity for everyone is still a prime goal in the progress of man, and that the end does not justify the means. College should have taught him self-discipline and the ability to recognize the difference between propaganda and reasoned thinking. College should have taught him that decisions must be made on principles involved rather than on the moment's expediency or the personalities of the people involved. A college graduate should have learned that he must not look at a man for what he is but for what he can be and true leadership is a leadership of service.

One cotton mill manager was talking to me several months ago about the morale of the employees in the plants under his supervision. He is a graduate of a Southern textile school, and he said, "Who am I but a servant of all the people who work for me? They are really the ones who have raised me to this position. The fact that the top executives in the company I work for offered me my present job means only that they recognize the fact that the employees are willing for me to assume the responsibility of directing their work. I am really resting on the shoulders of my employees." Because of his appreciative and respectful attitude toward the people who make up his production line his ability and record as a production supervisor are outstanding.

So industry is looking for young men who have proved by their college record their ability to do an assigned task well, who have shown by this record their dependably and their capacity to work. Industry is looking for young men to whom eventually can be entrusted positions of leadership and to whom the main consideration in accepting these positions is the joy to be found in the responsibility involved rather than in the financial remuneration. Industry is looking for young men who can approach their fellow workers and their work with the idea that service to one's company, one's community, and one's fellowman is after all the main thing in the effective and successful life.

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CAUSES AND DETECTION OF DAMAGE IN RAW COTTON

(Continued from page 13)

A cooperative full-scale study on the effect of excessive gin-drying on processing has been recently carried out by a group of mills, under auspices of the National Cotton Council and the Institute of Textile Technology. In this study, the economical importance of this type of damage became clear: Processing costs between "no heat" and "high heat" ginned cotton were found to be about $10.00 per bale of cotton processed.

Reprinted in modified form with the permission of the publisher, from a more complete article appearing in the May, 1956 issue of TEXTILE INDUSTRIES.

Outstanding Seniors

Horace Hampton Hunter is a textile manufactuing student from Central, S. C., who plans to graduate in August, 1956. Hamp is a Lieutenant Colonel in the AFROTC and is serving as a group Commander. He attended summer camp at the James Connally Air Force Base, Waco, Texas. Upon graduation, he plans to enter the U.S. Air Force.

Hamp is attending Clemson on a football scholarship and has been a member of the football team for three years. Naturally his hobby is sports, both participating and watching. He is a member of the Block "C" Club and has received honors for three semesters in his scholastic work. His summers have been spent in Washington, D. C., where he earned his spending money by doing different types of work.

After his stay in the Air Force, Hamp plans to enter the production division of the textile field.

Bobby Allen Painter is a textile manufacturing senior who came to Clemson from Arcadia, S. C. As hobbies, Bobby enjoys swimming, hunting and sports. He holds the rank of 1st Lt. in the Infantry branch of the Army ROTC and attended summer camp at Ft. Benning, Georgia.

Bobby is a member of Executive Sergeants, Alpha Phi Omega, Phi Kappa Phi and Phi Psi where he is serving in the office of Treasurer.

During the summer he has been employed by the Mayfair Mills at Arcadia, S. C. He plans to enter the Army in September. After his tour of duty, Bobby plans to work in the production line of the textile industry.

Ansel Crayton Sutherland is one of the many veterans returning to Clemson College, to further his education in textiles. Sut is a native of Pendleton, S. C., and is a textile manufacturing major. His main achievements at Clemson are in a scholastic field, being a member of Phi Psi and making honors for three semesters. His main hobby is golf which consumes a large amount of his spare time.

Richard Perry Moore, from Pendleton, S. C., is known to everyone as "Dick". He is majoring in textile manufacturing. While at Clemson, Dick has has participated in a great many things. Just to mention a few, we find that he is the Business Manager of THE BOBBIN & BEAKER, Treasurer of N.T.-M.S., a member of Phi Psi, Arnold Air Society, Scabbard and Blade, Senior Platoon, Minor "C" Club, Executive Sergeants and the Rifle Team. Also, he is a member of "Who's Who in American Colleges and Universities," and he was awarded the AFROTC Outstanding Award at San Antonio, Texas, where he attended Summer Camp. His hobbies are many but he seems to like hunting and fishing best of all. Upon graduation, Dick plans to enter the Air Force. The other plans for the future haven't materialized as yet, but upon completion of his tour of duty, he plans to enter the textile field.

Ronald Lee Childress—"Ron", as most of us know him, is a textile engineering student and hails from New Orleans, La. As hobbies, "Ron" enjoys reading about automobiles and English Motorcycles and occasionally working on them.

He is attending Clemson on a M. Lowenstein & Sons scholarship and has received scholastic honors for two semesters and high honors for five semesters. He is a member of S.A.E., having joined his junior year, and a member of Phi Psi during his junior and senior year. He is currently serving as Vice-President of Phi Psi, the textile honor fraternity.

His summers have been occupied by working in the cloth room, standards department and weave room of Lane Cotton Mills in New Orleans. He has also worked at Fulton Bag and Cotton Mill in Atlanta, Georgia.

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Standing (l to r) J. P. Campbell and C. E. Browne. (Seated) J. C. McConnell and E. T. Smith

The New Staff

It is customary in many organizations at Clemson for the Junior Officers or Staff to take over the reins at the close of the year. This is done in order to give the Juniors a dress rehearsal of their duties and to relieve the Seniors of some of their responsibilities. This also gives the Seniors a final chance to show the Juniors the ropes and to act as advisors.

The Junior Staff is headed by J. P. Campbell as Editor. Mr. Campbell is a textile manufacturing student from Anderson, S. C., and has done summer work at Abney Mills. Advertising Manager for the coming year will be Edwin T. Smith, a textile manufacturing major from Startex, S. C., who has had experience in laboratory, cost and standards during the summer. John McConnell, a textile manufacturing student from Sandy Springs, S. C., will serve as Business Manager for the 1956-1957 issues of THE BOBBIN & BEAKER. Mr. McConnel has worked at LaFrance during his summer vacations. Charles E. Browne, textile engineering major from Troy, S. C., will serve as Circulation Manager for next year.

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Notes on Underwear

By

Roy A. Cheney, President
Underwear Institute

The underwear industry like every other branch of the textile industry is faced with a terrific threat by imports from foreign countries.

In the popular line known as T-shirts or skivvy shirts, i.e., the quarter-sleeve knitted shirt which can be worn either as outerwear or underwear, the Japanese doubled the substantial exports of that garment to the United States in one year. Inasmuch as the Japanese average hourly earnings are 11 cents and they work a 70 or 80 hour work week and inasmuch as we in this country pay our people an average hourly wage of $1.18 to $1.20 under the 75c minimum plus fringe benefits such as insurance, vacation, etc., amounting to about 40 cents more, one can grasp very quickly the troubles which are coming up. Japanese merchandise is offered at probably 50 percent of what we must get for ours at least, and the impact of these goods not only lowers the price range throughout the whole scope of knitted goods but undoubtedly will take away our markets in the dime stores and the basement stores of the country. Another by-product of this threat is the fact that it will prevent mills from expanding, therefore I can predict confidently that the South, the Middle South and the Southwest will not see the growth in textiles and apparel which took place in the past decade. You yourselves can see very quickly that manufacturers are not going to risk money of their stockholders while this threat persists. Also and undoubtedly there will be less demand for the textile graduates and there will be increasing pressure throughout the industry for lower pay rates.

Incidentally, Hong Kong can undersell the Japanese and in the last report of the Chamber of Congress for Hong Kong, they were cussing out the Indonesians, Siamese and Indo Chinese for raising tariff walls and imposing quotas on imports of underwear. It seems a very strange thing that our State Department opposes any increase in tariff or the imposition of quotas in this country and yet pours money into countries like Indo China, Siam and what have you and permits them to do the very things which they have denied us.

Furthermore, the British who have been very strong in their protestation about our tariff have fixed things up through their so-called Sterling Bloc so that our markets in the British Colonies and possessions in the Caribbean have been wiped out entirely.

What our State Department is also doing is exemplified by an article in the January NATIONAL GEOGRAPHIC MAGAZINE about Turkey. It seems that in 1942 the Turks had about two thousand tractors. We have poured over 500 million dollars into Turkey and today they have over 40 thousand tractors. That, of course, is quite all right, but it has raised Turkey to the status of a large exporter of wheat, sugar beets AND COTTON.

All of this hurts the cotton farmer and hurts him drastically, and it seems utterly foolish to talk about parity and support prices, etc., etc., etc., when our State Department and Federal Government permits these termites that I have mentioned to undermine the very foundations of the farmer's prosperity.

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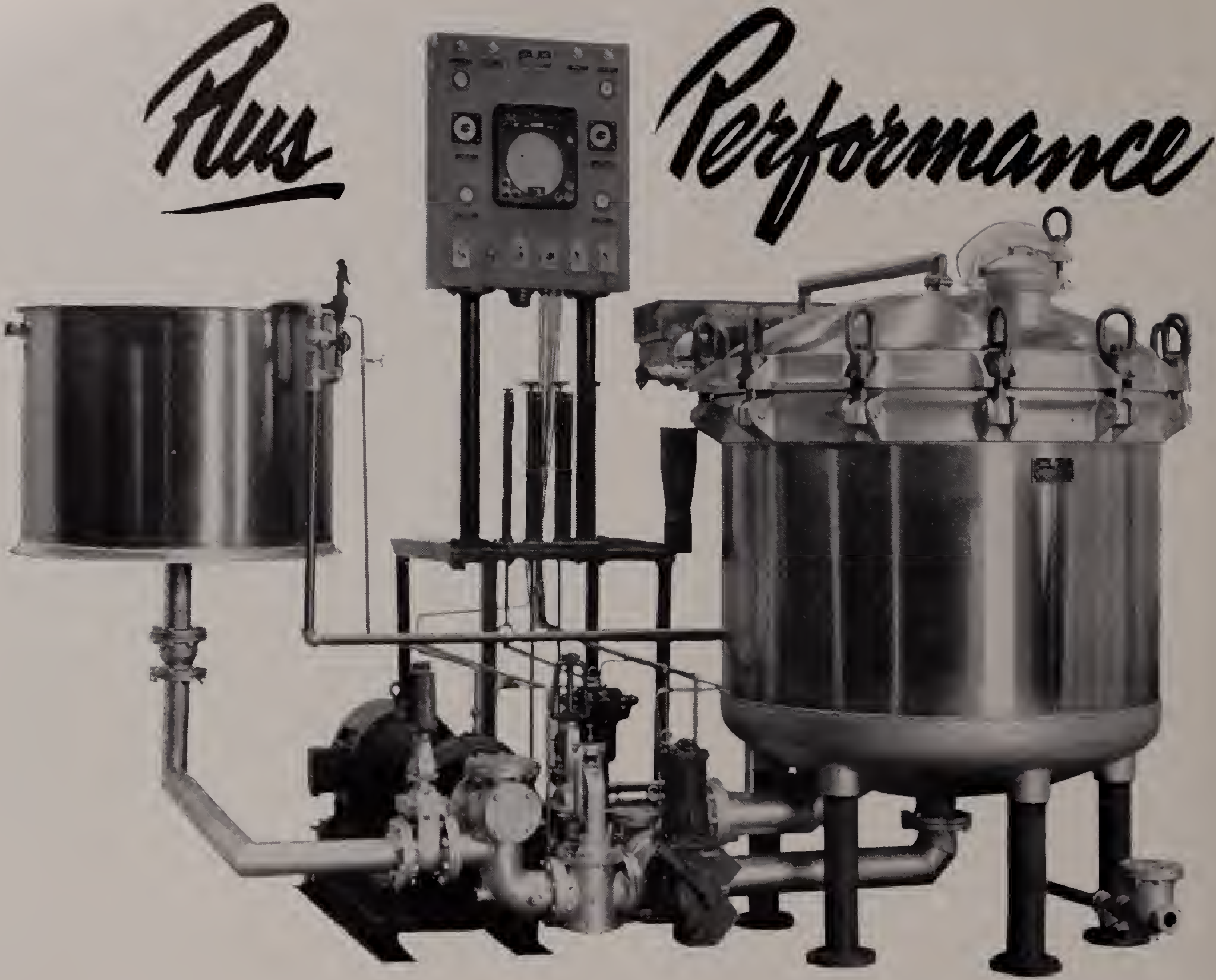

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ENGINEERS KEEPING PACE WITH DEMANDS

(Continued from page 11)

and these 14 slubbers are generally operated by two frame tenders and a helper. This is indeed real "automation."

In the spinning room, the introduction of the new Gwaltney type of spinning is bringing about a new era in the operations of this department. The 350,000 spindles of this advanced frame is now beginning to have its impact upon the industry in general in that the mills operating this new and revolutionary spinning frame are able to obtain quality at a cost which is setting a new standard in the market on the basis of most quality for the dollar.

It has been the experience of those mills operating large units of Gwaltney spinning under the proper conditions that the direct labor cost as well as the costs of maintenance create a distinct advantage in the total cost of production formula. It is evident that with the cost of direct labor at its present level in any cost equation that any factor which will decrease the percentage of direct labor in the total cost creates a tremendous advantage, and it is definitely within the ability of mills operating Gwaltney spinning to do this.

The "automation" inherent in the Gwaltney frame almost automatically increases the production per man hour, not only in the overall operation of the spinning room, but in each particular category; spinners, doffers, and auxiliary jobs.

A true study of the facts must convince any fair-operating executive that the future of his mill, in a way, tied to the use of Gwaltney spinning, which is now the universal frame for cotton, for synthetics, wool and all types of blends.

To review our contributions to the development of "automation" in the textile mill, we recall that over ten years ago our engineers foresaw this trend, and at that time laid the basis for implementing this trend into real action through a program of SACO-LOWELLIZING. This timely program, in its several forms, has been successfully carried on by many mills.

We are sure that even after the lapse of ten years since its first development, SACO-LOWELLIZING is a safe and practical way to secure, in the quickest time and at a satisfactory cost level, the definite, time and at a satisfactory cost level, the definite, money-saving, cost-reducing advantages of "automation."

Mills, to retain all of their calculated profit margin, must use modern equipment; they must SACO-LOWELLIZE and do this before it is too late.

SIGNIFICANCE OF QUALITY IN TEXTILES

(Continued from page 9)

schedule. This grading standard gives them tolerances that are consistent with good mill practices. It is based on what the cloth is to to be used for, what the customers will take, and what their competitors are doing. Should they grade to a perfect piece of cloth, then their seconds would be so high and costly that they would endanger their economic success.

Why do they grade cloth? To take out imperfections, especially those that would make the cloth unmerchantable for whatever the cloth is to be used for.

It is important for them to know that the cloth is going to be used for; then they can grade it accordingly. For instance; we all know that for a plain pattern print a lower quality will be accepted than that which is required for shade cloth, which requires a very high quality. Or, we know that cloth which is to be used for raincoat backing (actually it is only a base for about eight plies of rubber coating) can contain even more defects than ordinary prints.

The end usage of our cloth determines what kind and how many defects we should or should not let go, so we must be flexible to be able to meet these requirements.

Therefore, the most important duty of the cloth room is one that rarely ever is given the important attention it is due. That is, the prompt reporting of defects in the cloth to the department responsible for them. This information can be used to prevent more defective cloth from being made. Since a loom weaves from 3½ to 7 yards of cloth per hour, this information should be furnished promptly and used promptly.

Mill management all over the industry, in realizing the very important role quality plays in their ultimate success, has created quality control departments as an aid and assist to their manufacturing units. They are no longer guessing as to what other mills are doing; they know. They also know how they stand competively and what they must do to stay competitive.

J. P. CAMPBELL

From the Editor . .

William Shakespeare once wrote:

> "Life's but a walking shadow, a poor player
> That struts and frets his hour upon the stage."

and so the old actor leaves the stage and a new one takes over, thus the Junior Staff of THE BOBBIN & BEAKER takes control. Our hour upon the stage is the magazine which comes in four acts: one in the Summer, Fall, Winter, and Spring. At this time next year, our hour will have passed and in the interim we will strive to bring to you an interesting magazine. Our purpose is to serve students and industry alike; we hope you will like what we have to offer.

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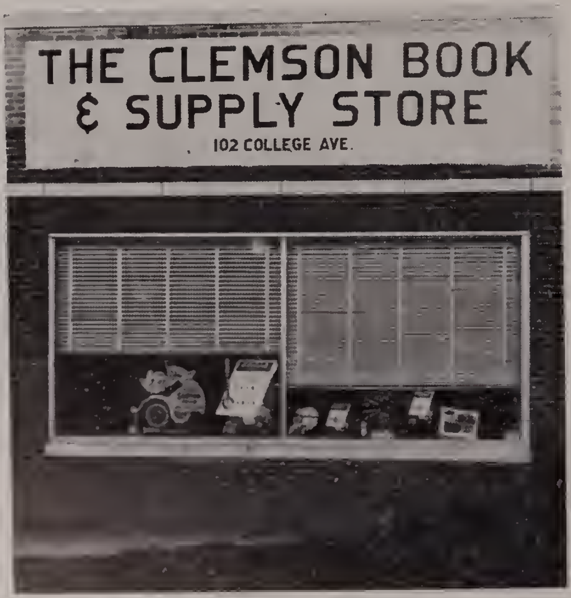

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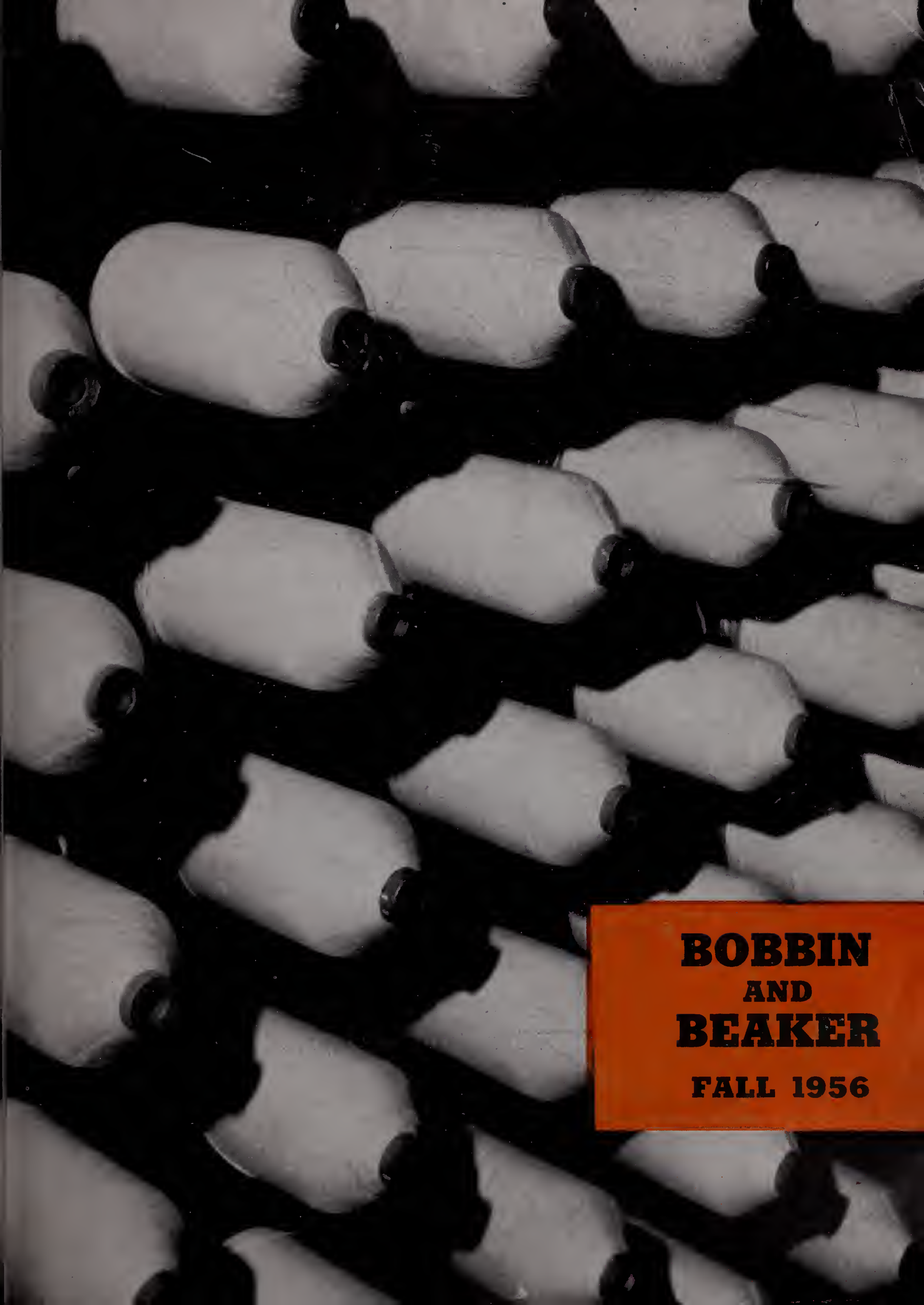

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FALL 1956

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THE COVER:
By TED PAPPAS '57

THE BOBBIN & BEAKER. Organized in November, 1939, by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge four times during the school year by students of the Clemson College School of Textiles. All rights reserved.

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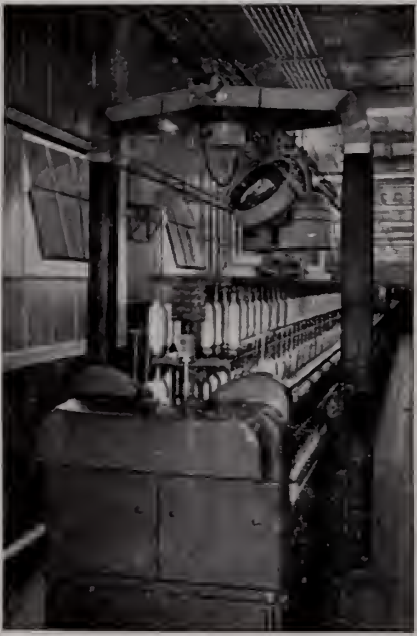
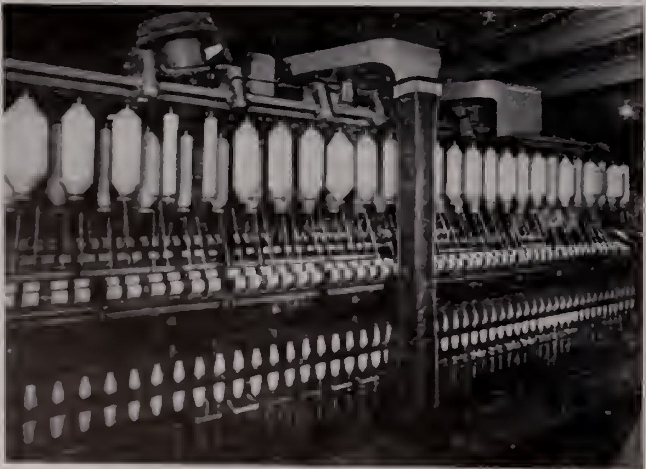


New type underframe cleaner applied to standard cleaner units traveling on Monorail track.

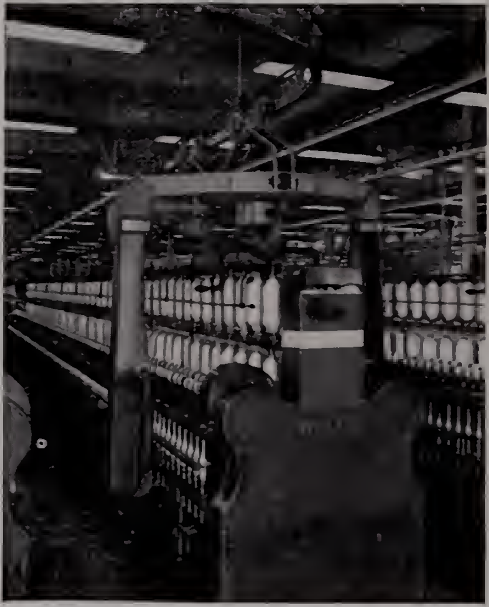
2

Creel mounted units clean ceiling, frame, and underframe.



3

Underframe unit mounted on old cleaning system to complete cleaning operation.



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Top row, left to right: Howard B. Carlisle, president of the S. C. Textile Manufacturers Associations; George P. McClenaghan, chairman of the group; J. J. Lyon, and A. B. Sibley. Bottom row, left to right, are Samuel H. Swint, J. C. Self, P. S. Bailey and F. E. Grier.

Clemson and the Textile Industry Initiate Program To Reverse 6-Year Downward Trend

Clemson College and the South Carolina Textile Manufacturers' Association have initiated a vigorous educational program designed to provide more college-trained personnel for the textile industry.

The industry has been alerted to the necessity of a long-range plan of action by a growing six-year decline in textile student enrollment. The stark truth is that the number of graduates during this period has been on the downgrade at a time when demands for qualified men in ever-expanding fields of the industry have been increasing.

It is startling fact that enrollment figures for this year will be significantly less, thus even accelerating the downward trend. At Clemson College, a leader in textile education, less than seven per cent of the freshmen expected this fall now plan to study textiles. Registrars at Georgia Tech, Auburn and North Carolina State have forecast a pattern identical with Clemson's.

Why?

"Our light has been hidden under a barrel," says R. C. Edwards, vice president for development at Clemson College, who left a top position in the industry in June.

"A combination of the unrestricted flow of Japanese products and fierce domestic competition," Edwards summarizes, "has created a pessimistic picture in the public eye. In waging an all-out publicity campaign, particularly against foreign competition, the industry has failed of necessity to talk enough about the positive; to re-emphasize its opportunities. Far too many young men fail to consider the challenge of a textile career because other industries appear to present greater opportunities. As a matter of fact, few industries, and certainly no other in South Carolina, offer greater possibilities for a successful, profitable career than does the textile industry."

Realizing the importance of the job to be done, the Board of Trustees of Clemson College requested the South Carolina Textile Manufacturers' Association to appoint a committee from its top executives to work with the Board and college officials in seeking a solution to any problems affecting the future welfare of the textile industry where resources of Clemson College might be used effectively. The initial aim of the committee is to perfect a plan which will assure a steady stream of college-trained men flowing into the industry each year.

Reaction to the request, on the part of the association, was both instant and positive.

President Howard B. Carlisle, Jr., appointed the following executives to represent the textile industry on this committee: George P. McClenaghan, vice president of J. P. Stevens Co., Inc., who is serving as chairman; J. J. Lyons, executive vice president of M. Lowenstein and Sons, Inc., Anderson; A. B. Sibley, vice president of Judson Mills and executive vice president of Deering Milliken & Co., Inc.; S. H. Swint, president of the Graniteville Company; J. C. Self, president, Greenwood Mills; P. S. Bailey, president, Clinton-Lydia Mills, Clinton, and F. E. Grier, president of Abney Mills and president of the American Cotton Manufacturers Institute.

Carlisle, personnel director of the Lyman Printing and Finishing Company, is an ex-officio member as president of the association.

The enrollment turnabout is a disconcerting revelation to an industry in the throes of a new dynamic and exciting revolution.

"The Industrial Revolution started in the textile industry in 1770 and has never stopped," says Association President Carlisle. "The development of new products, new fibers, new processes, and the application of automation has resulted in a tremendous need for college-trained men.

"This year," he illustrates, "there were from eight to 10 jobs for every graduate in textiles. The demand in the future will be even greater."

The manufacturers' association, to pinpoint specific needs of college graduates over a 10-year period, conducted a survey of all South Carolina textile plants. Results bluntly contradicted the trends in enrollment.

What are the factors which cause a young man to select or reject a particular organization or industry for his career? Certainly one of the major considerations is the matter of compensation involved.

A further survey of the industry in South Carolina reveals that men in position of responsibility are being very well paid. When measured by the yardstick of financial reward for services rendered, the opportunities in textiles become very apparent.

This survey indicates that approximately 40 percent of the management personnel filling positions of the type included in the survey of future manpower needs, earns from $6,000 to $11,500 annually. Men with greater experience earn substantially more ranging from $11,500 to more than $27,500 annually.

Almost since 1849, when first records were kept, South Carolina has been indisputably acknowledged as the "center of the textile industry." In that year there were only 18 cotton mills, with 36,500 spindles in place and consuming 9,029 bales of cotton. Today, with the nations's total cotton spindles in place decreasing, South Carolina's have grown to 6,474,000. This represents almost one-third of the entire total in the United States and twice that of all New England.

As a result, South Carolina is substantially ahead in the production of cotton woven finished goods, turning out more than two billion yards annually. This is one-third of the nation's total and about one billion yards more than that of the second state.

Today, capital invested in the state's textile industry is more than $600,000,000, an increase of $378,000,000 in the last 10 years. Goods valued at more than $1,600,000,000 are produced, constituting three-fourths of all those manufactured in the state.

Within the industry itself, however, production is varied. No longer is the textile business devoted almost entirely to the making of yarns. In one segment of the giant industry, the manufacture of clothing, more than 100 new plants have been established and production has now reached more than $120,000,000 annually.

Existing industry has been constantly expanding since the war, building new plants and enlarging old ones. A total of $64,596,000 was spent or allocated in 1955 for expansion, a recent State Development Board survey shows. The bulk of the capital outlay has been negotiated by existing industries, attesting to the continued faith of textile executives in the state's industrial future.

Eight completely new plants have been announced for construction, continuing a trend which has been evident since 1945. Some of the outstanding projects are the Cone Mills finishing plant at Union, the

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Remarks on a Career in Textiles

Hugh M. Brown, Dean
School of Textiles

The Textile School has the task of making clear to the students what is implied in a textile career. Lately a story has come our way that will illustrate some of our thinking on this problem.

The story is of three stone cutters who were employed on the construction of a Cathedral. One day a man came by and asked one stone cutter, "What are you doing?". The stone cutter rather apathetically replied, "I'm working for wages to buy bread and butter. The cost of living comes high these days." The man asked the next stone cutter the same question, "What are you doing?", and the worker somewhat impatiently said, "Isn't it plain that I am cutting stone?". The man then asked still another stone cutter the identical question, "What are you doing?", and with enthusiasm in his voice the third stone cutter replied, "I'm building a Cathedral."

Now all three men were working on the same job but with such a difference! Does anyone doubt for which of the three, the days seemed longest and for which the shortest—which probably did the poorest and which the best work—which one the construction company may have advanced the most rapidly through the years?

This story of the stone cutters can so aptly describe three textile students. The first one may say, "I'm studying textiles to get a job to make a living." He

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History of Textile School

Gaston Gage, Head
Yarn Manufacturing Department

In an address to the Cadets on the opening day of college in September, 1898, Dr. Hartzog, the college's third President commented "Today the doors of the first Textile School in the South are thrown open to students." He stated that the invested capital of the textile industry in South Carolina was $120,000,000.00. Today this capital is more than $600,000,000.00.

This textile building that was opened in 1898 was part of what is now the Physics building. The original building was from the tower where the entrance is to the south end toward the new dormitories. The offices and the Yarn Manufacturing were on the first floor. The Weaving and Designing and the Dyeing were on the second floor.

About 1903, the part from the tower to the present north end toward the YMCA was added. When this was added, the Dyeing was moved to the basement at this end and the whole top floor given over to Weaving and Designing and the first floor to Yarn Manufacturing.

This building is standard mill construction of its day. The similarity between it and the old textile mills can readily be seen. Heavy wooden columns support the heavy wooden beams which hold the floor and the roof. As in all mills of the day the tower was a water tank which held the water supply surrounded by a brick wall on all sides it acted as a more or less fireproof stairway. In the top of the tower was a water tank which held the water supply for the automatic fire sprinkler system. The tower at the back, as in the case of all mill buildings, held the toilet facilities.

Back of this building was a small boiler room. This furnished steam to heat the building and for use in the Dyeing department and for the slasher. This building was torn down after a few years.

The machinery was driven from a long shaft, extending the length of the building and having counter shafts driven by belts from the main shaft. This main shaft was driven by a direct current motor, the electricity for the motor being generated in a power house in the old Engineering building which burned in 1926.

In 1906 a new power plant was built to generate all power for the college and to furnish steam for the whole college. This power plant was designed by Dr. Riggs who at that time was head of the Engineering Department but later became President of the College in 1911. The old power plant was dismantled when this new plant was built in 1906 and it in turn was torn down when the present power house was built and the new dormitories came into being.

The old Textile Building continued to use direct current electricity from this 1906 power plant until the College started buying electricity from the Duke Power Company in 1924. Then the change was made to alternating current motors.

All machinery in the old building was driven from overhead shafting and belts until about 1930 when some individual drive equipment began to be installed. When the move was made to Sirrine Hall in 1939, all machinery was changed over to individual drive.

The Textile School opened in 1898 in charge of J. H. M. Beaty, who came from the managership of one of the mills of the state. He was joined in a year or two by F. D. Frissell, a graduate of the Philadelphia Textile Institute and he took over the Weaving and Designing. A year later they were joined by L. C. Raiford who came to take charge of the dyeing. He was a graduate pharmacist from Brown University. In these years, no textile subjects were taught until the Junior year.

In 1908, Mr. Fred Taylor, who now is retired from the U.S.D.A. and lives at Clemson, came to take over the Yarn Manufacturing. At that time Mr. C. W. McSwain, who was a Clemson graduate, was in charge of the Weaving and Designing and Mr. C. S. Doggett was director of the School and in charge of Dyeing. Mr. Doggett remained a Director of the School until 1927 when he was succeeded by Mr. H. H. Willis. During Mr. Willis' service the title was changed to Dean. Mr. Willis in turn resigned in 1943 and was succeeded by Mr. R. K. Eaton as Acting Dean. Mr. Eaton had been head of the Yarn Manufacturing Department since 1923. Mr. Eaton took the Acting Deanship as a temporary appointment, not desirous of the permanent appointment because of his health. Mr. Eaton was succeeded in 1945 by the present Dean, Dr. H. M. Brown.

From the beginning of the School through 1920 the textile course was entitled "Textile Industry." Beginning in 1921 the course was called "Textile Engineering" and there has been a course known as "Textile Engineering" continuously since that time. In 1924 an additional curriculum was added, known as "Textile Industrial Education." This course was designed to train teachers for high schools that wished to put in textile subjects. This course continued as such until 1943 when it was discontinued. There were never many graduates after the first three years.

A major in Weaving and Designing was begun in 1931 and continued through 1942. There were never more than from three to five students graduating in this course each year.

(Continued on page 26)

ARE YOU WITH THEM ?

By Johnny Hefner, T.E., '57

College graduates walk starry eyed across a stage each year, their diploma in one hand, numerous job offers grasped tightly in the other, not knowing which way to turn after reaching the other side. Most of these men will be found, years later, still grasping their diploma in one hand, a small pay check in the other, lost in the maze of filing cabinets provided by industry for employee's serial numbers. Yet, once in a while one of the same group that crossed that stage together will be found in Industry's penthouse, miles above the others, realizing ambitions that each of those happy wanderers in his graduating class had visualized so clearly while they walked across the stage. Why can one man in such a large group climb to such fantastic heights in industry while the others mill so aimlessly about the lower rungs of his ladder?

An analysis of some of the great industrial leaders of the past and of those still living, today, will definitely show that each possess the characteristics and principles of a leader, but men with these same qualities may be found in the multitudes of unknowns found in the lower ranks. What then, do the few at the top possess that pushes them to the peak of success?

The answer, in my opinion, is two-fold! If you look into reports of competent sociologists who have devoted years of their lives studying top level management and the source of this select group's ability to climb, always upward, you will find the following to be true:

1. These men are truly "individuals."

2. Job security is of minor importance in their way of thinking.

By calling these men individuals, I do not mean that they are eccentric or that they act differently from the remainder of society. These men think differently. They make sharp, clear cut, and timely decisions, and are seldom wrong in doing so. Their confidence is felt throughout the organization which they represent, yet they are not arrogant or cocky. This ability to have overflowing self confidence, and to be able to think clearly, day in, day out, is not in them by birth or by chance. It is there through a tireless effort to be "tops" in their field, to give industry something to remember them by and, most of all, through hard work. These men did not think they "had it made" after graduating from college. They realized that their diploma merely opened the door to industry and gave them a chance to progress forward, and upward. Instead of sitting still, watching the production line go by, these men walked uphill, and produced!

One thing, however, which seems odd to most of us when considereing these "men of industry" is their nonchalant attitude toward job security. How could they overlook themselves so easily? It never seems to register in their brilliant minds that one muffled decision could cost them their job, their livihood, and their social prominence. The truth is they are probably too busy at their work to worry about their job. They didn't reach the top by worrying. They climbed the ladder of success, rung by rung, never worrying about falling. Their college diploma is stuffed in their back pocket, leaving them two good hands to climb with; their eyes and thoughts are focused upward, to the next rung in that ladder. Are you with them?

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Causes and Detection of Damage in Raw Cotton III

Dr. A. N. J. Heyn

Professor of Natural and Synthetic Fibers
School of Textiles, Clemson College, S. C.

In previous articles, the various types of damage in raw cotton have been discussed. The present articles deals with the detection and identification of damage.

DETECTION OF DAMAGE

In damaged cotton most of the quality properties are impaired and changed. These chances may be a general indication of some type of damage, but cannot be used for the identification of damage since they may also result from other causes than damage, and since they are not specific. For **identification** of damage, special tests are used; the most important ones are briefly reviewed here.

MICROSCOPIC AND MICROCHEMICAL TESTS

The main microscopic tests for damage are based on the demonstration of **rupture** of the cuticle and primary wall, upon swelling of the fiber (1-3) or on the affinity for specific stains (4).

1. **Congo red test** — The most universal microscopic test is the congo red test. The principle is as follows. Congo red has a great affinity for cellulose, which composes the secondary wall, but cannot pass the outer primary wall and wax cuticle, for which it has no affinity. The dye can only pass the primary wall and stain the underlying cellulose, if the cuticle is ruptured. This is the case when the fiber is damaged.

The test is carried out by swelling the fiber in caustic soda and after quick washing, placing it in a concentrated solution of congo red. The fiber is investigated in 18 percent sodium hydroxide. By using different concentrations of alkali in the initial swelling, it is possible to differentiate between various types of damage. (see Figure 1).

2. **Balloon test**—Another test for rupture of the primary wall is the "balloon test" which has been originally designed for detecting microbial damage. In this test, the fibers are swollen in equal parts of carbon-disulfide and 15 percent caustic soda. Normal fibers swell and, after about half an hour, form so-called balloons or beads. The absence of balloons indicates damage (generally) from microbial activity (see Figure 2). A condition for balloons to be formed, is namely an intact primary wall, which constricts the swollen fiber at regular intervals between the balloons.

3. **Swelling in 18 percent caustic soda**—Swelling in 18 percent caustic soda has been designated as a special test for "cavitomic cotton." Abnormal high swelling is associated with the first stages of microbial damage. The fibers are mounted in the solution and after 15 minutes their diameter is compared with the diameter of normal control fibers. Normal fibers may, for instance, swell from 17 till 27 microns, damaged fibers up to 37 microns (see Figure 3.)

4. **Methylene blue test**—This is a micro-chemical test for hydrocellulose, which substance is formed by various types of chemical damage, e.g., acid tendering. The presence of hydrocellulose is indicated by an increased affinity for stain.

Details of the above tests are found in our text book on "Fiber Microscopy".[1]

CHEMICAL TESTS

1. **Extract pH**—This is one of the most promising tests for detecting microbial growth. The test was originally introduced for the detection of "cavitoma." It is carried out by kneading, with a glass rod for 30 seconds, one gram of the fiber with 15 cc. distilled water and determining the pH of the liquid. (This can be done in a simple way by adding .25 cc. of "Gramercy" universal indicator to 5 cc. of the liquid

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[1] A. N. J. Heyn. "Fiber Microscopy", a textbook and manual. Interscience Publishers, New York, 1954.

in a test tube and estimating the pH in comparison with the color chart supplied with the indicator). The normal pH of undamaged cotton ranges from 6.3 to 7.3 in case of microbial growth, it may be as high as 10.0. For cavitomic cotton values from 8.2 to 9.5 have been reported. The pH change would be a response to growth of fungi on non-cellulosic constituents of the fiber.

2. **Kendall copper index for reducing substances** (E.S.R.M.) — Another chemical test, originally used for identifying cavitomic cotton, is a test for reducing substances. One gram of cotton is kneaded with a glass rod in 3 ml. of hot, distilled water; 2½ ml. of extract is recovered by centrifuging. One ml. of the extract is brought to a boil after adding a "Clinitest" tablet (as used for urinalysis of sugar). After 15 seconds, the solution is diluted to 15 ml. and the color compared with that of standard dextrose solutions.[2] Although fungi can definitely cause a decrease in reducing substance content cotton fiber, a low content does not necessarily imply microbial action, since leaching by heavy rainfall and other conditions may complicate the situation.

3. **Tests for honeydew**—The presence of honeydew on the fiber can be demonstrated with the customary sugar reactions, e.g., Fehling's (Benedict's) copper solution. This reaction can be intensified by subsequent spraying of the cotton with phospho molybdic acid (using a glass atomizer). The cuprous oxide of the sugar contaminated areas react to give an intense blue color. The uncontaminated areas appear colorless.

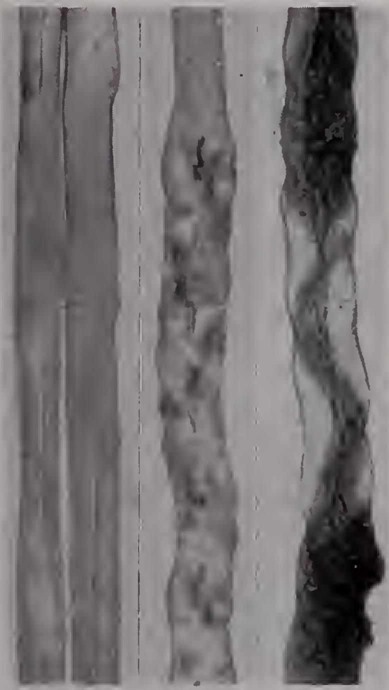

Figure 1. CONGO RED TEST: left, undamaged fibers; center, slight mechanical damage (note stained damaged spots); right, seriously mildewed fiber (upper and lower portion stained). (250 X).

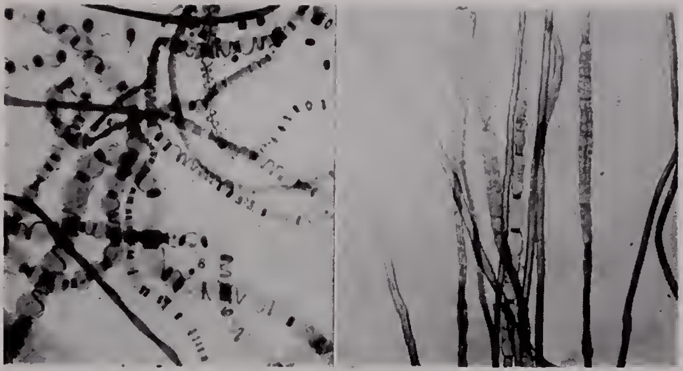

Figure 2. SWELLING TEST in carbon disulfide and sodium hydroxide; left undamaged fiber (note regular balloons); right, cavitomic cotton. Swelling is more evenly distributed along the cavitomic fibers, and no typical balloons are formed. (About 50 X).

4. **Tests for changes of the cellulose molecule**—Various tests exist for the detection of chemical changes of the cellulose molecule, such as a change in length (DP) and the formation of oxy- and hydrocellulose. These standard tests have long since been customary in cellulose chemistry and have been review in various texts.[3] They are only briefly mentioned here.

The **chain** length can be measured from the viscosity of cellulose dissolved in cuprammonium hydroxide or in cupriethylene diamine solution.

An increased **copper number** (the copper reduced from cupric to the cuprous state by the aldehyde groups) is also associated with degradation of cellulose molecules.

Also, an **increase of cardoxyl groups m**ay accompany degradation and is indicated by an increased absorption of basic dyes such as methylene blue.

A **test for oxycellulose is Turnbull's blue test.** It is based on the formation of an insoluble ferrous salt by the larger number of carboxyl groups. Methylene blue absorption can be, also, used for indicating carboxyl groups.

(**Hydrocellulose** is formed under the action of acids and results in shorter molecules of higher reducing power. **Oxycellulose** is formed under the action of oxidizing agents or light. Oxidation in acid condition results in an increase of aldehyde groups; oxidation in alkaline condition results in an increase of acid groups; Chain shortening only occurs if oxidation takes place in alkaline condition and in laundering).

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[2] The five standard solutions contain from zero till 1,5 mgr./ml. dextrose. E.S.R.M. value 1 corresponds to .1 mgr.-dextrose per ml. etc. In normal cotton, the values lie between 8 and 10, in cavitomic cotton in advanced stages, between 0 and 3.

PHYSICAL TESTS

1. **Color and light reflectance** — Discoloration of cotton occurs mainly during weathering and has been associated with the presence of dark colored mycelia of fungi. The determination of color and light reflectance is customary in normal cotton grading. New instruments, for measuring color and light reflectance by cotton, have recently been introduced. (Color Difference Meter and Cotton Luster Meter).

2. **Colored spots**—The presence of colored spots may indicate mildew or chemical contamination. Microscopic examination readily reveals mildew by the presence of dark colored hyphae or fructifications (conidia). Contamination may result from grease and tar. Tests with suitable solvents like carbon tetrachloride differentiates the latter spots from the first ones.

Certain yellow spots have been associated with pink boll worm. Other types of yellow spots show fluorescence in ultra violet light, and have not yet been fully explained.

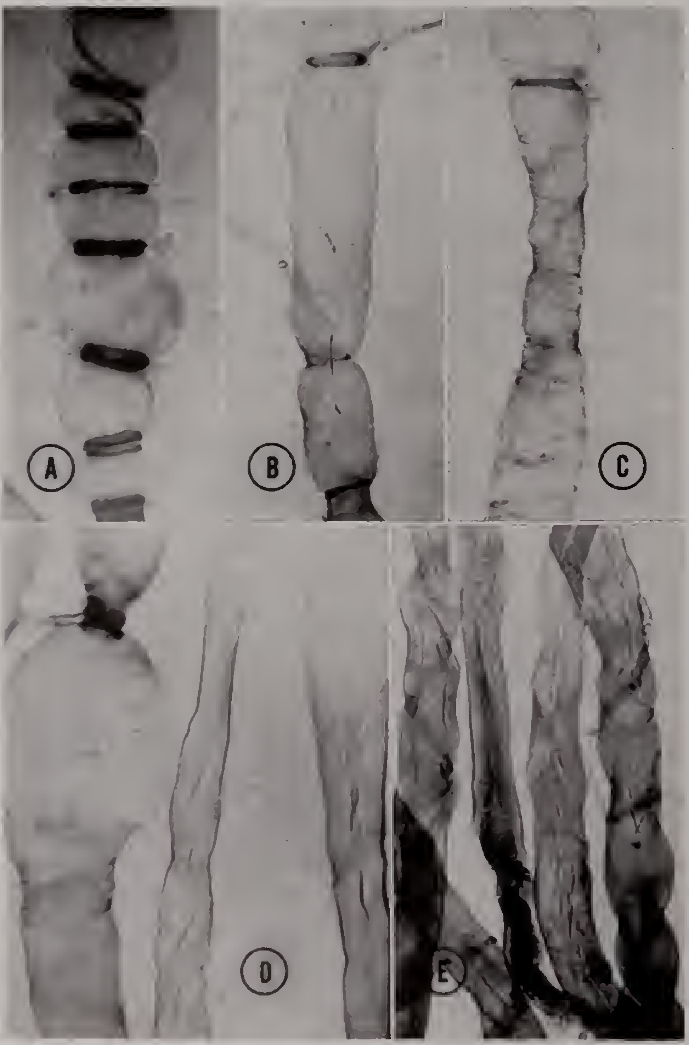

Figure 3. SWELLING TEST in carbon disulfide and sodium hydroxide: A—undamaged fibers (note regular balloons separated by strings of primary wall); B and C—cavitomic cotton (note absence of regular balloons, strings of primary wall at large, irregular distance); D—different degrees of swelling in cavitomic cotton; E—fibers severely damaged by fungi (note absence of typical swelling, and presence of fungal hyphae). (About 230 X).

3. **Fluorescence in ultra violet light** — the use of ultra violet light for detecting microbial and other damage has been known for many years and has been suggested long ago for detecting mildew in cotton. The investigation in ultra violet light has lately gained new interest and has even been "rediscovered." A tendency exists now for using it as a rapid universal test for damage. Wave lengths of 3660 and 2537 A. U. are used. The long wave ultra violet radiation is sometimes called "black light." Inexpensive portable lamps are available. (They are used in our Textile School).

Various types of fluorescence are found in cotton (dull ivory, yellow, bright green, and a blue type), and a variety of different causes may underlie fluorescence in cotton.

Many contaminants such as machine oil and tramper grease and certain oil sprays, as used lately in processing, have an inherent fluorescence.

A bright green fluorescence is associated with growth on the fiber of a special fungus (Aspergillus flavus). The growth of another fungus (Alternaria) may cause white fluorescence. This type of microbial fluorescence has been first discovered in cottons from Arizona, Texas and California. The author found in his present research project that, also, certain cellulose bacteria may cause fluorescence in cotton. (see Fig. 4 and 5) The growth of other fungi and bacteria is not associated, however, with fluorescence and it is not allowed, therefore, to use fluorescence as a **general** test for microbial growth as has been done sometimes.

Intense yellow fluorescence and a reddish fluorescence of low intensity are associated with the prescence of honeydew, and have been suggested as a rapid test for this defect.

An ivory white fluorescence has been associated with **age** and with **heat** damage. This fluorescence has been ascribed to the presence of oxycellulose formed by exposure to light and heat. It has been suggested as a rapid test for these types of damage.

It will be clear from the above, that fluorescence of cotton is a complicated phenomenon, which may result from different causes.

BIOLOGICAL TESTS

The most positive evidence for microbial damage is the isolation and growing of the microorganisms from the fiber on suitable substrates, and the testing of their cellulolytic ability. The microscopic recognition of hyphae on the fiber is in itself not sufficient for this purpose, since many fungi grow on other

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[3] J. Skinkle, **Textile Testing**, Chemical Publishing Co., Inc., 1949.

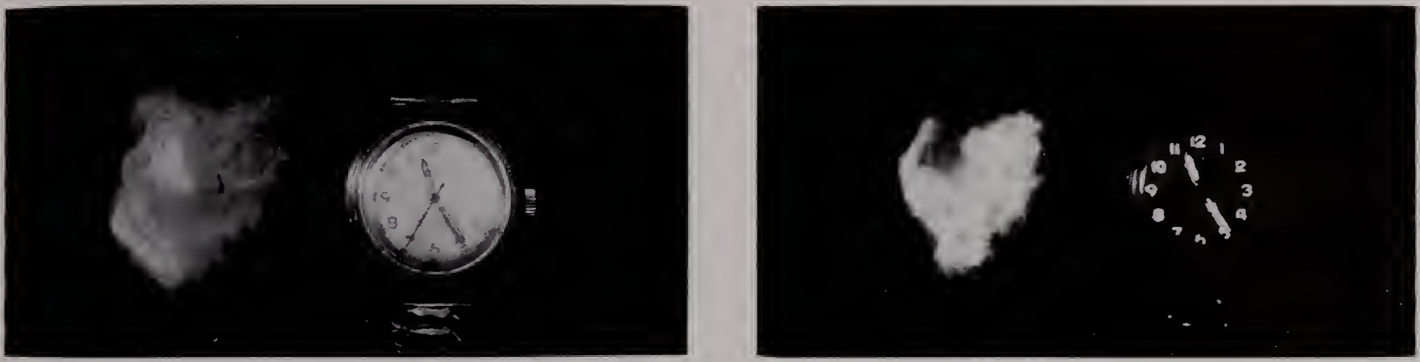

Figure. 4. FLUORESCENT COTTON: left in light; right; in ultra violet light; radium dial for comparison.

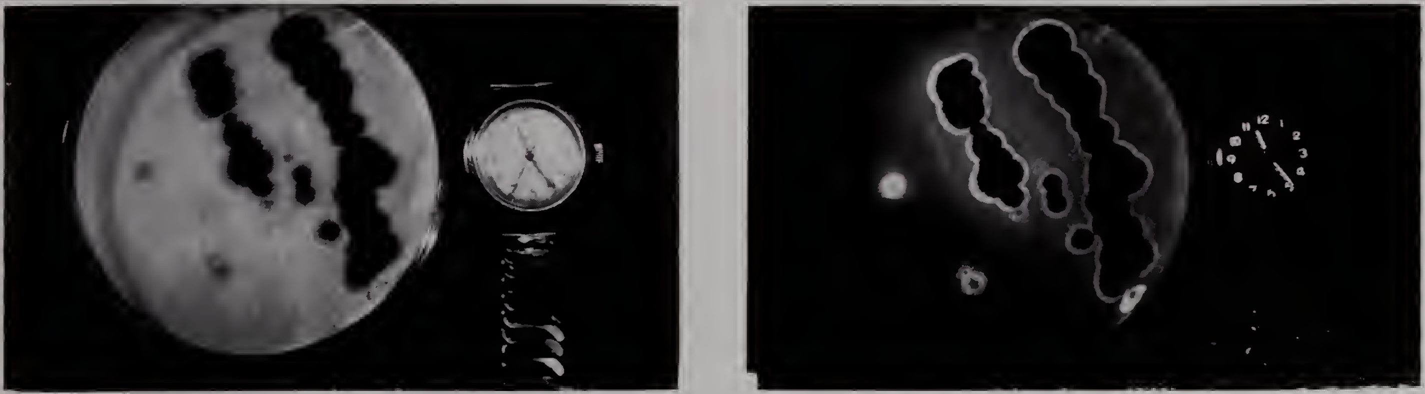

Figure 5. CULTURE ON FILTER PAPER IN PETRI DISH OF FLUORESCENT BACTERIA ISOLATED FROM FIELD COTTON: left in ordinary light; right in ultra violet light; radium dial for comparison.

components of the cotton fiber than cellulose, without causing damage to the cellulose.

For purposes of identification, it often suffices to bring small tufts of the fiber on sterile 2 percent agar agar in glass dishes under which condition the fungi rapidly grow out to form fructifications.

The cellulolytic ability can be directly tested by transferring the fungus on a substrate containing cellulose **as the only carbon source** (a suitable substrate is sterile filter paper wetted in an aqueous solution of certain mineral salts). Figure 6 is a photograph of colonies of cellulolytic fungi grown in this way on filter paper.

Standard techniques for testing fungi use cotton duck instead of filter paper, the loss in strength of the fabric in a certain period of time is used as a measure for the cellulolytic activity of the microorganism.

Modern **biochemical** methods for detecting microbial growth in cotton are being investigated in Clemson.

From the above, it will be clear that only a few exist that are fully specific. The most specific tests are those for **microbial damage. Mechanical damage** can be specifically recognized by the Congo red test, in the hand of experts. Changes in D. P. are not specific for mechanical damage. Certain types of **chemical damage,** like oxidation of cellulose, can be chemically detected. The changes in D. P. in chemical damage, again do not furnish a specific test. For the detection of **heat damage,** no suitable specific test exists at all. The decreased D. P. is not specific since it occurs also in mechanical and chemical damage. The Congo red test requires great experience and is both tedious and unreliable here. Certain changes of some mechanical properties like brittleness, torsion resistance, etc. might offer a basis for tests. It would be of utmost importance if a suitable test for this type of damage could be designed.

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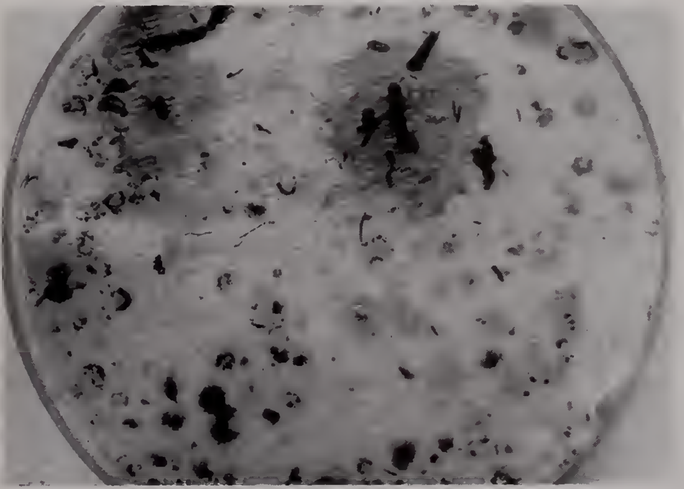

Figure 6. CELLULOSE-DECOMPOSING FUNGI: grown on filter paper (in Petri dish); paper wet in a solution of mineral salts.

Public Relations . . . 4th Pillar of Support For Management

By
CHAUNCEY W. LEVER
Director of Public Relations
Abney Mills - Erwin Mills

Abraham Lincoln said: "Public opinion is everything. With public opinion nothing can fail; without it nothing can succeed."

Public relations is the fourth pillar of support for management, along with production, finance, and distribution. Public relations was so established when two truths were recognized: first, that sound public acceptance business cannot hope to exist.

People today listen to more words, more stories, and more ideas than ever before. As a result, people hear the story about us and form an attitude or an impression.

The practice of public relations did not gain general acceptance until some twenty years ago. Even now it is not as widely understood as it should be.

Fundamental

Public relations is fundamental in every constructive effort of management in the sense of its being an effort to obtain favorable public opinion of a company and its products.

An often-quoted corollary is that every company in any way in contact with the public has "public relations" whether it likes it or not. A company's public relations is expressed in public opinion of the company and, whether it is good or poor, depends solely on what the company does about it.

Any company can enjoy the advantages of good public relations if it will make an adequate effort.

No business management is today considered to be progressive and modern by other business managements unless the public likes it, unless its public relations are in good order.

Must Be Planned

Public relations must be planned. Two types of plans may be used: (1) an overall-plan which outlines the entire program for a certain period and which can be revised periodically, and (2) a "Project" plan which considers one activity at a time. Both should be committed to writing.

The public relations program of work should cover (a) the need, (b) the goals, (c) the special groups to be reached, (d) ways to reach these groups, and (e) ideas that will help put across the company's story.

Special Publics

The company should direct its public relations program to at least seven special publics as well as to the general public: its employees, the people of its community as neighbors, its trade groups, its customers, its suppliers, its stockholders, the students in schools and colleges.

If the company is to serve its customers with quality products and make prompt delivery of these products, then its employee relations must be good.

The company which does not have friendly relations with the people in its community is likely to have trouble keeping its employees loyal and its labor turnover at a minimum. It will have difficulty in recruiting promising young people. These are only three of the penalties for a poor local reputation.

(Continued on page 26)

Left to right, L. T. Runge, President; Stanley Powell, Secretary; J. E. Atkins, Jr., Warden; E. F. Puryear, Sr., Warden. Absent when picture was made: Vice-President, J. H. Coleman; Treasurer, Richard McClellan.

Clemson's Iota Chapter of Phi Psi

Phi Psi fraternity had its beginning on March 18, 1903, at the Philadelphia College of Textile Engineering. Five students of that institution met with the comomn goal of founding a fraternity which was to promote good fellowship, social intercourse, mutual advancement of its members and the art of textile manufacturing. These ideals have been promoted through the years, and Phi Psi can now point with pride to many of its alumni who hold high positions in all branches of the industry.

Clemson's Iota chapter was formed in May, 1927. Since its beginning, Iota chapter has constantly been engaged in activities and projects aimed at improving the local organization.

This year, the members are selling towels in the school colors with CLEMSON TIGERS woven down the center. For several years, the fraternity has made its club room in the basement of the textile building available to all students. This has become a favorite place to relax between classes and enjoy refreshments from the two vending machines located there.

Eligibility for membership in the fraternity is based largely on an individual's class standing at the textile school. Persons who are in the upper one-fifth of the junior class or the upper one-third of the senior class are given consideration. Also, the top two men of the sophomore class are eligible for membership.

Officers are elected each spring to serve their terms the following year. This year's officers are: President—Louis Runge, Textile Manufacturing, Greenville, S. C.; Vice President—Jim Coleman, Textile Manufacturing, Anderson, S. C.; Secretary—Stanley Powell, Textile Chemistry, Rock Hill, S. C.; Treasurer — Richard McClelland, Textile Engineering, Spartanburg, S. C.

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*Patent Nos. 2,610,363; 2,490,544; 2,412,357.
Other patents pending

PROCESSING SYNTHETICS ON A ONE-PROCESS PICKER

RAYMOND C. GAGNON, Director
School of Textiles
International Correspondence Schools

Adapting to the Requirements

Introduction of synthetic fibers to the textile industries presented many complex problems. In practically all instances, machinery manufacturers were not prepared to cope with the problems. Responsibilities were placed on the shoulders of mill personnel—from the superintendent down to the operators. These persons had to solve the problems if the mills were to satisfy the needs of the buyers. Picking was not left out of this picture. As a matter of fact, picking became one of the most important processes involved.

Although most of the machinery used for processing cotton can be used without change for the synthetics, the picker must undergo certain drastic changes in order to obtain the best results. Many models and makes of pickers were quickly adapted to synthetics and they produced good laps consistently.

There has been much controversy over the type of picker best suited for the job. You can understand this if you realize that individual mills adapted its own pickers to meet their requirements. In spite of what one mill or another may say, there are certain conclusions which were reached, and these were reached in practically all the mills. A brief outline for processing various synthetics will be given here as a guide to any person or persons who may some day be responsible for this process. It must be remembered, however, that certain changes might have to be made to fit each particular problem.

Beaters

Blade beaters are not recommended for synthetics although they have been used with some success. Porcupine, or Buckley beaters also are not too satisfactory for the staples. As a rule, most machinery manufacturers and fiber manufacturers will recommend the use of Kirschner beaters with bullet-nose pins. This type of beater will open the stock satisfactorily and does not have the tendency to load up. Also, the bullet-nose pins, with their somewhat rounded ends, are less apt to damage the fibers.

General Recommendations

For most synthetics, the grid bars should be closed as much as possible. This prevents the loss of good fiber but does not interfere with the air currents. The air currents should be strong enough to properly carry the fibers to the cages. In other words, the fans must be operated at high speeds, as much as 1,400 rpm in some cases.

Most cotton pickers are equipped with a single split-lap eliminator, which acts on the lower surface of the lap as the lap is formed. In processing synthetics, a double eliminator should be utilized; that is, another split-lap eliminator should be made to act on the upper surface of the lap. This arrangement will generally eliminate all split laps, common with synthetics. It has been found practical to use roving made of the same fiber being processed to prevent split laps. In this case, a wooden creel can be constructed to hold the roving bobbins and placed over the calendar section of the picker. As the lap is being started, the roving is drawn around the lap pin and is made to rotate with the lap. This forms a binder between each successive layer of the lap. Here, however, you must be certain the fibers are identical.

Important Data

The following data is based on practices that have been proved successful. As you have been told, certain changes from speeds and adjustments suggested are often necessary to meet specific requirements. You will find, however, that the information given will give you a sound and firm knowledge with which to begin.

RAYON

A two-beater one-process picker will give the best results. Maximum production should be between 350 and 400 pounds per hour. Beats per inch should be maintained around 33 to 36. Fan speeds should be about 1,100 to 1,400 rpm. Any speed above that should be avoided if possible. Adjust the dampers so that most of the draft will come through the top cage.

ACETATE

Maintain the beater speed between 700 and 800 rpm for best results. Recommended fan speed is 1,600 to 1,800 rpm. A double split-lap eliminator is practically a necessity to produce a good acetate lap.

NYLON

Kirschner beaters should be used in almost all instances. Other types can be used successfully when low percentage blends of nylon with cotton are to be processed. Beater speed should be held to from 800 to 1,100 rpm, and 33 beats per inch is generally sufficient. Fan speed is regulated so that the stock is directed to both cages in equal proportion—1,200 to 1,750 rpm should do the trick. Nylon's bulkiness more or less requires a light lap, say around 12 ounces per yard and about 30 yards in length. A setting of 1/8 to 1/2 inch between the beater and feed rolls works well. Pressure on the lap rack should be from 40 to 60 pounds.

ORLON

Orlon can be processed more or less similar to nylon with minor changes. The beater to feed roll setting should be between 3/16 and 3/8 inch. For Kirschner beaters, 25 to 30 beats per inch will produce satisfactory results. Air flow should be directed primarily to the top cage to prevent split laps. Fan speeds of 1,400 to 1,700 rpm are usually required. Pressure on the calender section is critical with Orlon. Some mills have used cardboard tubes over the lap pin, but a single layer of heavy paper works equally well in preventing the lap pin from sticking. Above all, paper does not prevent the lap from contracting. If Orlon laps are to be stored for any amount of time, they should be wrapped in paper.

DACRON

This staple will react somewhat similar to Orlon in a one-process picker. Beating of the staple should be held to a minimum. Fan speeds of 1,200 to 1,400 rpm give satisfactory results. The weight of the lap should be in the immediate vicinity of 12 ounces per yard.

DYNEL

Kirschner beaters with bullet-nose pins should be used for best results with this fiber. Beater speeds of from 550 to 700 rpm are sufficient. Fan speeds should be high to produce an even lap — 1,400 rpm being quite satisfactory. Beater to feed roll settings should be about 1/4 inch. Bulkiness is the big problem here and limits the length of finished lap although the usual weights of 12 to 14 ounces per yard can be utilized. Static electricity can be minimized with highly controlled humidity in the picker room.

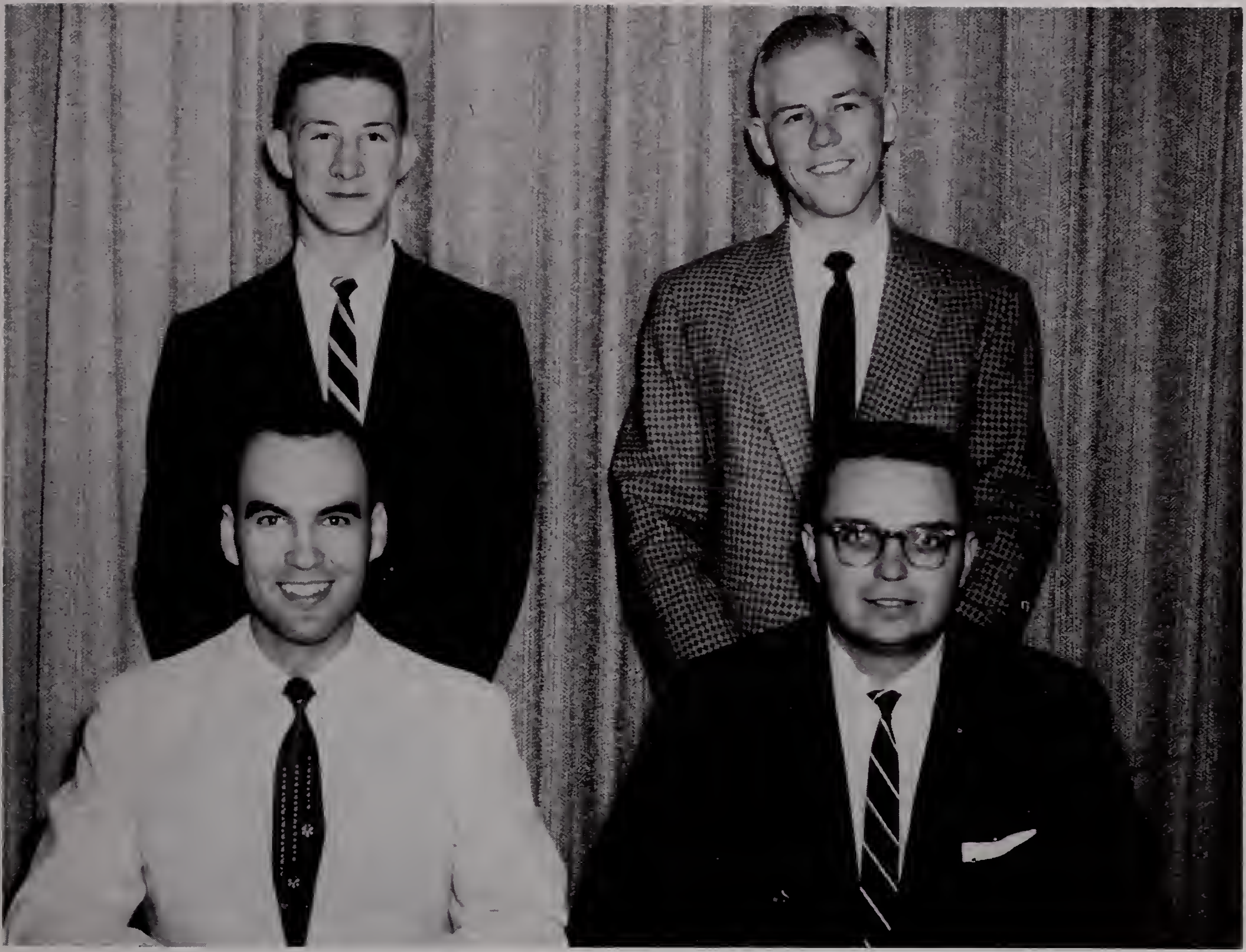
ACRILAN

This is another of the many synthetics that can be successfully processed on cotton pickers. Lap weight should be limited to from 12 to 13.5 ounces per yard and around 30 yards in length. Beater speeds of from 650 to 900 rpm have been used satisfactorily. Pressure on the lap rach can be between 40 and 60 pounds for good results. Unlike Orlon, a cardboard tube is recommended for use over the lap pin. A double split-lap eliminator is practically a necessity. If the picker is equipped with a blending reserve, the draft in the finisher section should be reduced by about 30 percent.

Summary

The outlined procedures may or may not be suitable to all mills. It is up to the mills themselves to determine exactly what settings and speeds will produce the best results. The foregoing recommendations offer a starting point and an excellent position from which to begin.

No attempt has been made to cover all the synthetics manufactured for consumer use today. New synthetics are apppearing all the time. It has been attempted here to supply a general background and knowledge which can, at some future date, give you somthing to start with in an attempt to achieve good results. By keeping abreast of all new synthetics and the recommendations of the fiber and machinery manufacturers you are in a position to be many steps ahead of the next man.



Seated, left to right: D. E. Smart, Vice-President, Greenwood, S. C.; W. T. Linton, Jr., President, Columbia, S. C.; Standing, left to right: T. B. Philips, Treasurer, Anderson, S. C.; J. C. Bright, Secretary, Spartanburg, S. C.

National Textile Manufacturers Society

The Alpha Chapter of the National Textile Manufacturers Society was formed on March 13, 1951, for the purpose of bringing about a more intimate relationship between the textile industry and the undergraduates of the textile manufacturing, textile engineering and knitting schools.

The organizational colors of the Alpha Chapter are white and purple. The seal is a coat of arms containing a bale of fibers, a cone of yarn, and a bolt of cloth.

All sophomore, juniors, and seniors majoring in textile manufacturing, textile engineering and knitting are eligible for membership. There are no requirements for membership except those listed above.

During the last few years membership and interest has fallen off considerably because of one reason or another. This year, however, NTMS is striving to get back on its feet again and become a worthwhile organization as it was in the past.

This year, NTMS plans to have one speaker a month. This speaker will be from some branch of the textile industry or an industry closely related to textiles. NTMS meets twice monthly, so with a speaker scheduled for one meeting, the other is left free for a business meeting or a student program.

Last year a directory was purchased for the Textile Building by NTMS from money made from the sale of socks. This year, NTMS again plans to sell socks for some worthwhile cause which has not been decided upon. Also in the planning stages is an open house at the Textile Building during Homecoming Weekend with guided tours through the building sponsored by NTMS.

These are just a few of the activities planned for NTMS in 1956.

Outstanding Seniors

Charles Wates Bussey, Jr., is a Textile Manufacturing senior from Henderson, N. C., and plans to graduate in June, 1957. Aside from participating in football, in which he is presently captain of the varsity team, he has proved himself by making excellent records in many campus organizations and by maintaining commendable grades. He received honors his junior year. Charlie is a member of the Tiger Brotherhood, treasurer of the Arnold Air Society, vice-president of the Blue Key, a member of the Block "C" Club, and a Group Commander in AF-ROTC.

Upon graduation Charlie plans to serve his required time in the Air Force. After this he is interested in entering the production line of textiles.

Newton Stall, Jr., is a Textile Manufacturing senior who hails from Greenville, South Carolina. Newt is a person who has participated in practically every activity on the campus. He is now President of the Presbyterian Student Association, President of the Clemson Student Body, and Student Chairman of Religious Emphasis Week.

Organizations in which he is a member are Phi Psi — the textile honor fraternity, Blue Key — a national service organization, Phi Eta Sigma, Phi Kappa Phi—a scholarship fraternity, and the YMCA Cabinet. He is also Alternus of the Central Dance Association, Lt. Col. in Army R.O.T.C. and is holder this year of Fiberglas Senior Scholarship.

After graduation Newt will enter the Army for 2 years and then return to the textile field.

James H. Coleman, Jr., is a Textile Manufacturing senior who came to Clemson from Honea Path, S. C., but he now resides in Anderson, S. C.

Jim is very active in sports in that he plays baseball and is presently a member of the varsity football team. Although he is very active in sports, his talents are noticed not only in the many organizations to which he belongs but also in his scholastic work.

His activities include being vice-president of Phi Psi, president of Block "C" club, secretary-treasurer of Blue Key, treasurer of Tiger Brotherhood and a member of the Arnold Air Society, Council of Club Presidents, and Student Assembly.

Jim is a Major in the Air Force ROTC and will enter the Air Force upon graduation.

Research at Clemson During the Past Summer

Dean Brown and Assistant Professor J. S. Graham were working on several machine developments, including the following:

1. A sliver evening device. It is hoped the device will be used in conjunction with roving frames to produce a more nearly even roving from sliver of varying size. It seems the device may be able to correct for long time variations of plus or minus 25% and greatly reduces short time variations.
2. A shuttle checking device for looms in which the shuttle is tightly gripped when it is completely boxed, eliminating rebound and reducing the amount of checking usually needed.
3. A new loom pick motion in which the energy for the pick is stored up during the part of the cycle that is idle in usual loom operation, resulting in a large reduction in peak power, and considerable reduction in average power required to operate the loom and also greatly reduces vibration, resulting in smoother operation of the loom and longer life of the various parts.

Professors J. C. Hubbard and J. H. Marvin carried out a study of various opening methods, carrying the stock through all processes into yarn. The quality of the yarn was correlated with various degrees of opening.

Professor L. H. Jameson had a project on determination of stress strain curves for various finite loading times. The study showed that the curves are considerably different than those taken from the regular loading method and that the yarns have a considerably different modulus for finite loading times.

Professor T. D. Efland and Dean Brown continued work on the development of a knitting machine, designed in the Textile School. The machine knits unusual designs without needles, using thread guides only.

Professor E. A. LaRoche carried on a study of elongation in flat bundle tests for a number of selected cotton. The purpose was to correlate the elongation with variation of cotton strength with flat bundle gage length.

C. V. Wray, Associate Professor of Textiles, was engaged in a fiber density project during the summer. The object was to determine, in seven varieties of cotton, the change in fiber density during progressive stages of maturity. Further tests have been planned as a result of the findings and these will be undertaken at a later date.

Most of these projects are still in progress and when completed the articles and results will be published in various textile journals.

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CLEMSON AND THE TEXTILE INDUSTRY INITIATE PROGRAM TO REVERSE 6-YEAR DOWNWARD TREND

(Continued from page 8)

Amerotron woolen goods plant at Barnwell, both multi-million dollar undertakings, and Bigelow-Sanford plant at Landrum.

Despite inroads by Japanese imports, the growth has continued this year. Almost $21,000,000 has been allocated for new plants and expansions, with another large textile company, J. B. Martin, choosing a South Carolina location for a Southern branch.

A development of significance for the woolen and worsted industry is the establishment of a wool top dyeing plant. Modern Dye Southern, at Sumter. South Carolina now has "all three"—two wool processing plants and the new dyeing company nearby.

In 1955 the second large wool processing plant, Santee River Wool Combing (branch of Amedee Prouvost of France) began operation. Previously, the Wellman Combing Company (branch of Nichols and Company, Boston) had started production at Johnsonville, not many miles away. Both are importing their raw wool through the Port of Charleston, now the full-fledged port of entry for wool for the Southeast, and potentially the No. 1 port of the nation in the future.

Another important development is the invasion of the carpet industry. Three "big names" in the industry have located in the state — Mohawk, Bigelow-Sanford and Alexander Smith. Four other rug mills were already in operation.

Encouraging trends today are toward integration and diversification. In one vast South Carolina plant, the largest on one floor in the world, a bale of cotton comes in the back door and a finished product goes out the front door. Diversification means that the industry need not depend on the success of any one phase and that all possible profits from the various steps of production can be realized.

The State Development Board says textile men find South Carolina ideally suited to their needs. Studies point to an almost unending supply of labor. For every 100 men on the farm who die or reach retirement age, there are 215 grown men to take their places. This means a constant stream of workers from the farm into industry.

A second potent factor, says the Board, is a sound, stable state government. For many years in South Carolina there has been a drop in corporate taxes. The state property tax was abolished many years ago. In 1945, the franchise tax was three mills. Later it was reduced to two mills and, finally, in 1953 was reduced further to one mill. Last year a provision went into effect permitting new industries a tax carry-forward on initial loses for three years.

The textile industry today employs 127,250 wage earners, or 68 per cent of the total number of employed industrial wage earners in South Carolina. To those employees, $336,845,000 was paid in 1954. That represents 71 per cent of the total industrial wages paid in the state's fiscal year.

The industry, as a whole, stretching through 39 states, employs 1,631,100 in 7,000 plants for an annual total payroll of $2,985,000.000. Total assets of the industry on Dec. 31, 1955 had reached $8,819,000,000.

The very scope and size of the textile industry demands confidence and faith. South Carolina's textile leaders are dedicating themselves to the task of building confidence for the future.

The advisory committee, working arm-in-arm with the Clemson College Textile School and the industry, will concentrate on four major immediate tasks.

Item number one is the development of a plan for enlisting the "full interest and support" of the state's textile industry in selling its career opportunities to the enrollment of large numbers of outstanding young men in the Clemson Textile School.

Item number two is the development of a plan to provide funds for more academic scholarships in the Clemson Textile School. Clemson recently passed the $25,000 mark in yearly textile scholarship assistance, all of which is earmarked for upperclassmen. The critical need is aid for freshmen . . . students entering the textile school who do not meet requirements currently imposed by the companies selecting recipients.

Sixteen of 46 scholarships and fellowships existing at Clemson are awarded by college selection committees. Fourteen directed to juniors or seniors, one to a sophomore, and two to graduate students. None to freshmen.

Item number three is the development of a program of summer employment for all students of the

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Textile School. This program, providing each student with experience under practical mill conditions, is being developed on recommendations of the school and concurred in by the industry committee.

The committee, finally, seeks to more clearly define the expectations of the industry regarding the type of training desired in a textile graduate.

The gears of promotion were accelerated late last month at the 19th Southern Textile Exposition in Greenville. Through this medium, Clemson College saluted the textile industry's contribution to the industrial development and progress of South Carolina . . . for invaluable support of textile education through the J. E. Sirrine Foundation and other textile agencies . . . and for focusing attention on career opportunities in the industry.

Clemson also saluted its textile graduates for magnificent records of service and accomplishment in the textile and allied industries . . . for research successes that have improved the competitive position of the industry . . . and for relentless work in the field of textile education. Clemson further saluted future textile students for recognizing the variety and virility of the industry . . . and for choosing a career that affords unlimited opportunities in South Carolina.

Copies of this ad were posted on bulletin boards of the state's textile plants and high schools. Promising high school students were invited to attend the exposition. An information booth at the show was staffed by students and faculty members of industry. Literature made available includes three recently-published brochures on "Textile Opportunities at Clemson," "Clemson — a Dream Come True," and "There's a Place for You at Clemson."

The program was, in summary, three-dimensional. It proposed to keep before the public "a most interesting story of a most interesting industry," and to keep the Clemson School of Textiles and the industry it serves on a mutually cooperative basis.

And, foremost, it proposed to maintain an awareness that "people"—most particularly the supply of trained leaders—is the most important single component necessary in the future success of the textile industry . . . anywhere.

REMARKS ON A CAREER IN TEXTILES

(Continued from page 9)

may be the one whose **first** question of the personnel man will be, "What will be my starting pay with your company?". He may be the one who thinks passing his work is good enough and when he gets a position will always be thinking more of the size of the pay envelope than of giving the company a better day's work. He may be the one a union could most easily influence in its favor, believing the company could be forced to pay higher wages whether there would be profits or not. Like the first stone cutter he may think and say that he is just making a living.

The second textile student may say, "I am studying textiles to become a good overseer or superintendent. I want to learn how to run a good spinning room, a good weave shed or a good mill." This student will study harder than the first to learn all the technical phases of textiles and methods of management. He will realize the importance of working with other people and of good writing and speaking ability. Wherever employed he will strive to do a good job, using the approved methods of promoting production, reducing waste, and managing men. If asked what he is doing, like the second stone cutter he may say, "Can you not see that I am over-seeing this shift or running this spinning room?", or this grey mill, whichever is the case.

The third student may seem to be studying textiles like the first two but there will be a difference. He will be looking forward to having a thrilling part in the great, challenging textile industry, the third largest industry of the nation. He sees that textiles, being the dominant industry in the State gives him an opportunity of having a larger part in the State itself. It goes without saying that this student will make the most of his college opportunities and will realize that in addition to good operation of his shift, or of his plant, he will reach his fullest development only by enthusiastically becoming a part of an ever larger team as he advances to higher positions with his chosen company. When he gets into the industry, like the first student, he will be making his living but his real interest will be something greater. Like the second student he will be running some manufacturing unit but his attitude will not be the same. His heart and soul will be in it because of his larger vision of his part in the whole industry. In production he may have the insight and enthusiasm that is needed for his division to succeed, where otherwise it would fail. He may be one with the imagination required to produce the ever changing, glamorous fabrics that capture the consumers interest. In research he may be the one to discover new methods, processes or machines that will advance his company and all the industry. In management he can aspire to reaching positions of influence in his own company, in the industry and in the State. Whether he reaches these high places or only serves in lesser capacities he will know that all are necessary and just as the third stone cutter was "building a Cathedral," he can say that he is building the textile industry.

HISTORY OF TEXTILE SCHOOL

(Continued from page 10)

In 1931 the major in Textile Chemistry was begun and has continued to the present time. There have usually been about ten or twelve students graduating in Textile Chemistry each year.

After the Second World War there was a general curriculum revision in the whole College. In the the School of Textiles, the old Textile Engineering course was revised, dropping the few engineering subjects that were left and adding more of the Social Sciences and Textile Management courses. The name was changed to "Textile Manufacturing." At the same time a new curriculum in "Textile Engineering" was adopted, including more engineering courses than had ever been in the old "Textile Engineering" course. The Textile Chemistry curriculum was continued with only minor changes. With the addition of a Knitting Option in the Textile Manufacturing curriculum, we have our present major courses.

Except for the classes of 17 and 21 in 1902 and 1903, the number of graduates from the Textile School before 1925 remained small, never as many as twenty, a good part of the time closer to ten and in 1908 and 1909 there were no graduates. In 1925 the graduating class went above thirty but again dropped down so that thirty was not reached again until 1934. From then on there was a steady increase until the War took all students. Up until the War, the largest graduating class was in 1941 when 88 were graduated. After the War, with the return of veterans, there was a great increase in the enrollment in the School of Textiles and it reached its peak in 1950 when 216 degrees were awarded.

The present textile building, Sirrine Hall, was occupied in September, 1938. It was built during the Deanship of H. H. Willis. It was built as a P.W.A. project at a cost of about $485,000.00. It would probably take $2,000,000.00 to replace it today. At the time it was completed there were no funds for new equipment. Soon afterwards, the South Carolina Legislature appropriated $50,000.00 for equipment and the mills of South Carolina raised another $50,000.00 for equipment. By this time the Second World War had started and equipment could not be bought until after the War. Then, beginning in 1947, this $100,000.00 was used to buy new equipment for the new building. In 1950 largely through the effort of Senator Charles E. Daniel, who is a life member of the Board of Trustees, about $300,000.00 was made available to the School for equipment. With gifts and discounts from the makers of equipment, the the value of equipment procured is far more than the money that was spent. All equipment in the School of Textiles is valued at about $2,000 000.00. This expansion program was completed in 1951. At this time Sirrine Hall was dedicated.

In the early years not a great many Textile School graduates went into industry. David and Harry Jennings, brothers who graduated in 1902, both went into the textile industry and became mill presidents It was not until about 1920 that the graduates started going into the textile industry and its allied fields in large numbers. Beginning with this date there is a rather imposing list who has reached high places in the industry.

PUBLIC RELATIONS — (Continued from page 16)

Objectives

A company which does not now have an organized and effective public relations program might begin by drafting a statement of objectives and sub-objectives as follows:

1. Maintaining and furthering:
   * The long standing prestige of the Company.
   * Good community relations.
   * Good employee relations.
   * The cooperation between the company and opinion moulding groups — press, radio, television, and civic leaders.
2. Sub-Objectives:
   * Familiarizing the public with the services and the institutional significance of the company.
   * Best serving the community in a lasting manner.
   * Giving recognition to civic accomplishment.
   * Giving recognition to civic accomplishment.
   * Cooperating with community organizations.
   * Making available in the best posible way the services of the mills.

A program of activities should then be prepared and initiated.

Good public relations cannot be attained overnight. Nor can good public relations be maintained without continuing effort.

Public relations is simply doing the right thing and telling the employees and the community what you are doing.

Being a good business citizen is not enough. We must tell the public about it. At the same time, bragging has no place in public relations.

Everyone is a public relations man—from the president to the learner.

The understanding and participation of management is essential. Public relations consciousness must be developed within the company.

The functions of the public relations department are two-fold: (1) to convey and interpret information about public attitudes and reactions to members of the organization, and (2) to convey information and impressions about the organization to the public or to individual "publics."

The most powerful influence on a company's community standing **is what its own employees think and say about it.**

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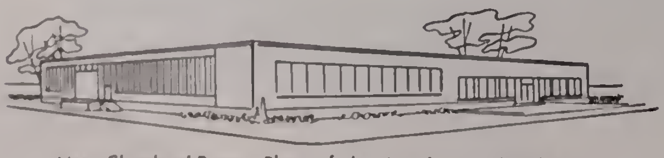

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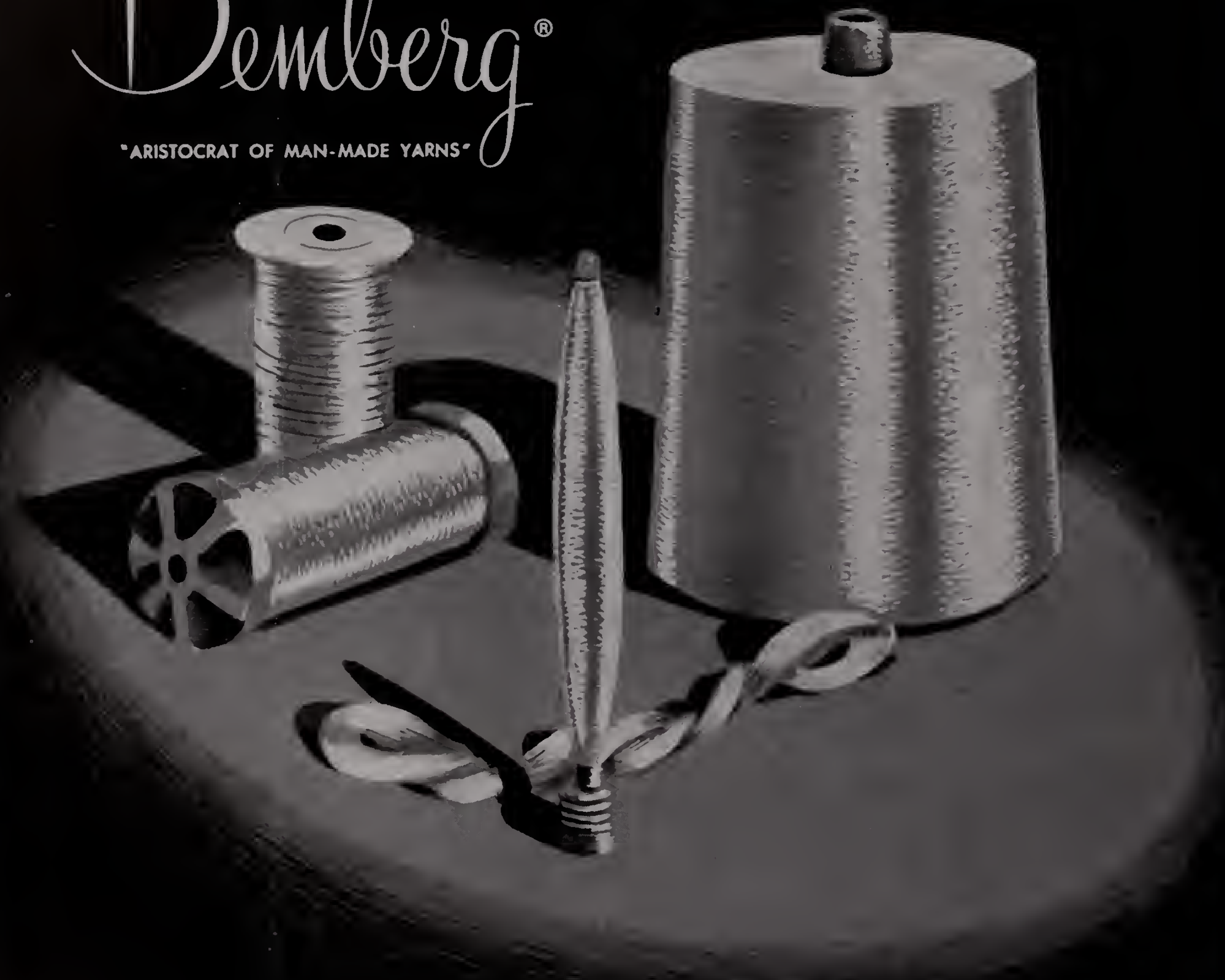

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The Cover: A microscopic cross-sectional view of an Orlon fiber . . . Ted Pappas '57

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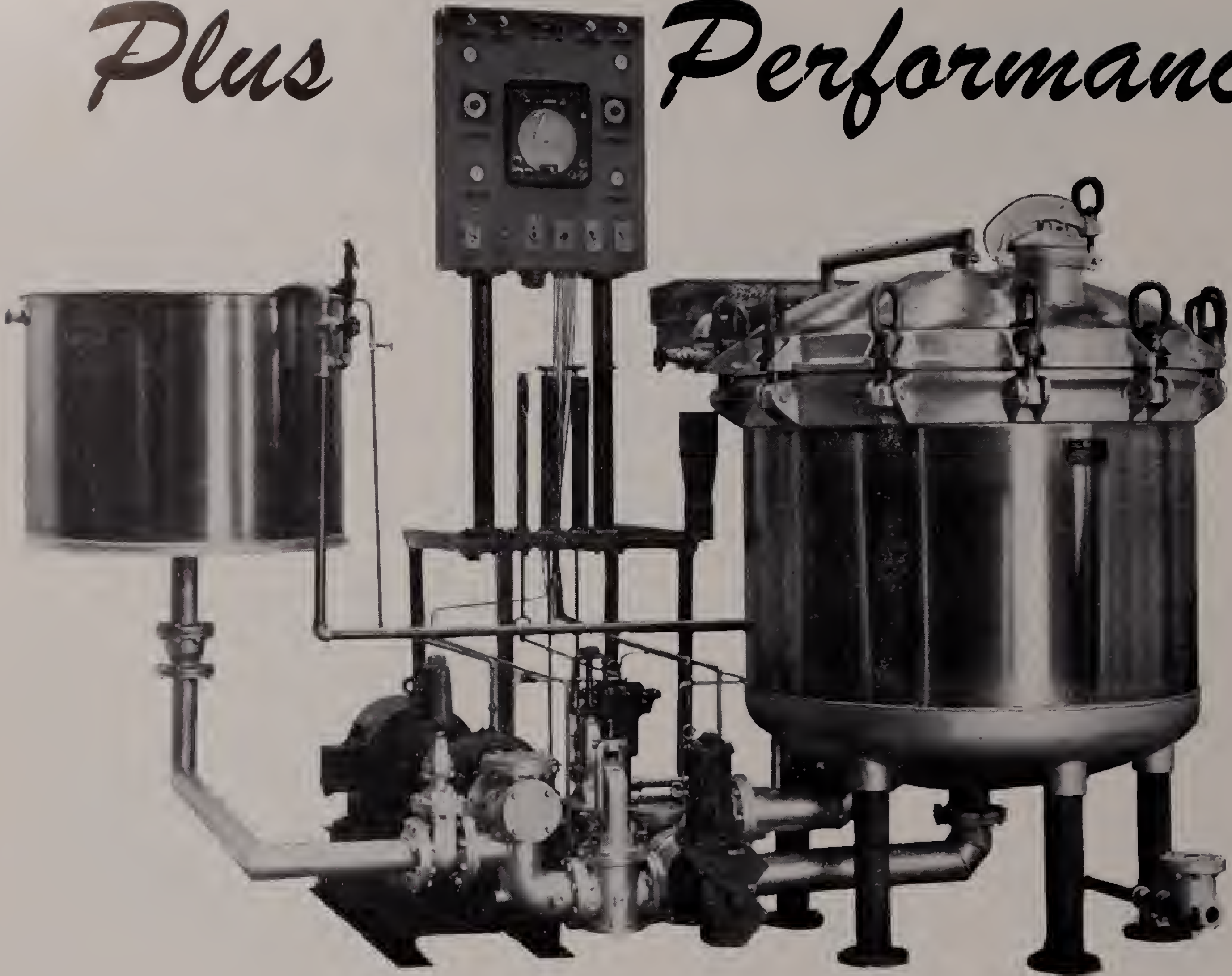

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South Carolina Points The Way in Re-Emphasizing the Importance of Textile Education

R. C. Edwards
Vice President for Development, Clemson College

On November 13, I had the pleasure of meeting with the Education Committee of the American Cotton Manufacturers' Institute and the National Council for Textile Education during the semi-annual meeting of the latter group which was held at the Sedgefield Inn in Greensboro, North Carolina, on November 12, 13, and 14.

It was very refreshing to observe these two groups representing widely differing segments of the textile industry deliberating with such earnestness about a problem which vitally affects every segment of the textile industry.

At a time when the demand for increasing numbers of better trained men is of paramount importance, the enrollment in the textile schools of the United States has been declining at an alarming rate. The fact that the textile industry is becoming increasingly aware of this problem and of the part it must play in meeting the needs, was clearly reflected in the thoughts and actions of the Education Committee of A.C.M.I.

Mr. Julian H. Robinson, of the North Carolina Finishing Company, Salisbury, speaking as Chairman of the Committee, pledged a close relationship in the future of the textile industry with the Council. Mr. Robinson outlined the main objectives of his committee as (1) closer relationship with the textile schools and (2) a program that will make full use of college trained personnel by A.C.M.I. member mills. The Education Committee plans to make a survey within the textile industry and among the textile schools to determine what steps are necessary in meeting the problem of college trained man power.

Deans of the college textile schools, including Dr. H. M. Brown, of Clemson College, envisioned the move as the most significant boost for textile education in recent years. In effect, joint action of the two groups reflects complete endorsement of the far-sighted educational and public relations programs initiated jointly by Clemson College and the South Carolina Textile Manufacturers' Association early this fall.

In speaking to these groups, the writer emphasized the fact that problems facing the textile industry today are insignificant when compared to the problems of the future unless positive action is taken now. Freshmen enrolling in September, 1957, will not graduate before June, 1961. Therefore, at least an additional four to five years of continuing reduced graduates is inevitable.

The public must develop a better appreciation of the textile industry. This job, of necessity, is mainly an industry responsibility. The fact that recent surveys indicate that an anti-textile career atitude is prevalent among textile families has made it necessary, in many instances, for textile students to be recruited from non-textile areas.

The program inaugurated at Clemson College is designed to provide graduates to take advantage of the estimated 4,500 job opportunities which will be available in the textile industry of South Carolina during the next ten years.

As a part of this program, the high school guidance counselors throughout the state were invited to Clemson for a two-day workshop on November 30-December 1. While the group was on the campus, particular emphasis was placed on the challenging opportunities offered by the textile industry. Mr. F. E. Grier, President of A.C.M.I. and of Abney Mills, delivered the principle address at the Friday night banquet.

The approach we envision as being necessary to meet the needs includes the development of a positive public relations program that will (1) sell the public generally, and the high school student at the grass-roots level specifically; (2) attract students with high academic potential and outstanding leadership qualities; (3) create a clearer understanding between industry and the Clemson School of Textiles, a definition of the roles of each; and (4) a review of the type of training given in the Clemson Textile School.

As a means of helping to attract the really outstanding high school students, we have requested the textile industry of South Carolina to provide funds for additional academic scholarships, particularly for freshmen.

Four measures have been outlined for the streamlining of textile training at the college level. They are (1) a greater emphasis on the scientific approach to textile manufacturing processes; (2) greater emphasis upon the study of English, mathematics, and the humanities; (3) addition of a lecture series dealing with those subects which cannot be taught satisfactorily in the textile curriculum; and (4) development of a positive summer employment program that will provide practical manufacturing experience under mill conditions.

Since there is a limit to what can be taught in theory, the summer training program is designed to give students a view of the industry unattainable by any other method. This summer training would become a vital part of the students' educational program, materially increasing his value to the organization hiring him upon graduation.

The summer training program would, in addition to providing the student an opportunity to operate machines under mill conditions, give the student an opportunity to learn the full significance of the importance of big production efficiency, good quality, low unit cost, and to achieve an understanding of the basic factors which contribute to each. Time would be devoted to giving the student an oportunity to learn the importance of good management in the successful operation of a textile plant and the many factors which contribute to successful management.

At the end of each summer vacation period, a written report covering the student's activities would be prepared by the mills involved and forwarded to Clemson College to become a part of the permanent record of the student. This program also will afford an excellent opportunity for faculty members of the textile school to visit the mills of the state in follow-up on the progress of their students.

The lecture series phase this of program is not new to the industry. Use of workshops and orientation seminars is being widely expanded. If men with years of experience can benefit from this approach to better education, then certainly the textile education program can be greatly enhanced through this approach.

Lectures would deal with such subjects as merchandising, labor relations, workman's compensation, and unemployment compensation insurance, technical advancements in machines, processes, raw materials, etc., and in such management areas as cost accounting, industrial engineering, inventory control, production planning, etc. In setting up such a program, industry support is of primary importance be-

(Continued on page 24)

Informal Organization: Fact, Not Fiction

Frank A. Burtner
Associate Professor of Sociology

In recent years a great deal of research has been undertaken in the field of human relations in industry. Part of the research has been centered in the universities and colleges — Harvard, M. I. T., Yale, Cornell, Michigan, to mention only a few, and part has been undertaken by industry itself — General Motors, General Electric, Goodyear, Bell Telephone, and many others. The Armed Forces constitute still another group which has shown increasing interest in this field; in fact, the Armed Forces redoubled their investigations as a result of findings during and since World War II. Some of these research findings have confirmed things which we knew, while some have raised questions concerning our past and present practices.

This new knowledge transforms the question, "What makes the worker more productive?", into the question, "What makes the worker more willing?". In other words, from the great mass of research has come a new orientation, a new point of view concerning the nature of work and the nature of the worker. Work is seen as a GROUP ACTIVITY rather than an individual effort, and the worker is viewed as a person whose attitudes and work effectiveness are conditioned by social demands from both inside and outside the work plant. And in this connection, no distinction is made between the front office and the plant. On the contrary, the group nature of work involves all those from the plant manager to the sweeper, from the president to the janitor. The basic problem of human relations in industry becomes then, to mold the group into an effective team; to bring about that sort of organization which will satisfy both the wants of management and the wants of workers.

Despite evidence to the contrary, many businessmen continue to conceive of teamwork as an "intangible" and define it in terms of production and profit. This conception stems quite naturally from the rather simple picture of work life generally held by administrators. The objective of life is "success," that is, the maximization of production and profit. The ingredients of success are improved equipment, trained personnel, and good organization. If success is not forthcoming, one of these ingredients is lacking. The remedy in any case is simple and obvious. Get new equipment, get better trained personnel, and undergo a thorough reorganization.

But even when the prescription is concocted by experts and followed carefully, the desired objective is not always attained. For example, many plants with outmoded machinery, untrained personnel, and haphazard organization succeed while other plants with modern equipment, highly trained personnel, and model organizational schemes sometimes fail. During World War II, some of the new defense plants which had the best equipment, personnel, and administrative organization had poor production records. What is more startling, people often preferred to work in antiquated, blighted plants, and many instances can be cited of industrial strife occurring in plants which were considered the epitome of technical and organizational planning.

But to the executive, the logic of efficiency dictates that such problems as described above be dealt with in terms of formal, that is, blueprint, organization, and so studies are made of supervision, wage rates, and incentive schemes. Perhaps too much thought has been given to this kind of organization in the plant, including informal organization.

By informal organization is meant that network of personal and social relations which are not defined or prescribed by formal organization. It may be thought of as including every aspect of social life that is not anticipated by technological and formal relations. The structure of informal organization is rather complex, made up of interrelated items such as gangs, friendships, and cliques; an organization and structure which defines the relations between these groups; customs and codes of conduct for group members, including codes which regulate activities within the group as well as activities towards other groups; ideas, beliefs, and values; informal group activities such as ceremonies, rites, recreation, joking; and communication systems which inform members of occurrences vital to group solidarity and action. Above all, informal organization is spontaneous and arises wherever and when people interact within a work situation.

Informal organization has frequently gone unrecognized, largely because it is invisible to the untrained observer. When an organization is running smoothly, it is generally assumed that the formal organization is in control and adequate for the tasks at hand. That is, it is assumed that the organization chart, the job descriptions, the wage and salary scale, and a statement of company policies, which, taken together, constitute a set of blueprints of the formal organization of the plant, are all that is necessary to the attainment of company goals. However, unusual things happen in work plants which cannot be explained by analysis of the formal organization alone. Some of these "unexplainable" events would include such situations as the following: absenteeism rises without apparent cause; a rash of stealing and destructiveness: a brawl occurs during an executive conference between two groups which had shown no evidence of antagonism in previous meetings; one department excels another comparable department in production, earnings, and performance without apparent cause; a group plans and executes a number of social functions whereas another never engages in social affairs; a rumor sweeps through a plant. To the untrained observer, these events are likely to be regarded as irregularities and explained in terms of the personalities involved. To the trained observer, however, these are instances of informal organization in operation, evidence that the system of social organization within the plant does not always function in accordance with the chart of formal organization. Informal organizations and systems of relationships grow up which are not specified on the chart and which may in some respects contradict it. The following examples will illustrate this fact.

> The organization chart and job description state that worker Brown is directed in his work by supervisor Green. But worker Brown is a member of a car pool to which supervisor White belongs, and White is supervisor Green's superior. On the drive to and from the plant Brown and supervisor White become well acquainted and soon we find Brown is looking to White for much of his direction.

Such arrangements as those described above "just grow" without any premeditation or planning.

Or take this hypothetical situation, variations of which have been depicted an untold number of times on movie and television screens:

> The organization chart and company policy statement indicate that executive Black is responsible for approving leave for personal reasons for department head Blue. A member of Blue's family in a distant city has died and he wants some extra time to help settle the family affairs, but he feels that executive Black will grant only time to attend the funeral. Blue does not feel very secure in his relations with Black, but he has established very friendly relations with Black's attractive secretary. Blue arranges for the secretary to present his request for extra leave and, with a pleasant smile, a flash of silk, and a dash of French perfume, she is able to get it approved.

It is something more than understatement to point out that the above situation is not in the book!

Each of us has at one time or another recognized that his relations with others are critical to his success or failure. Sometimes these relations take the form or "pull," "drag," "prejudice," and favoritism." We usually regard these things as unfortunate and, at best, inevitable. They are considered private problems and, therefore, not within the realm of scientific investigation.

As a matter of fact, pull, favoritism, and prejudice are group phenomena and capable of investigation. They occur in work situations as extension of friendships, cliques, and personal antagonisms. As such, they are as much a part of the social organization of industry as the supervisory structure. Informal relations are not accidental or incidental to the operation of industry. On the contrary, no organization can function effectively if it does not contain a spontaneous network of interpersonal relations.

The study of informal organization is important if for no other reason than that it is needed to provide the complete picture of organization. We need to know how informal and formal organization operate because the two are interactive. It is impossible to understand how the supervisory structure actually operates without knowledge of the informal social organization in it.

Informal organization and action appear to develop for several reasons. One is that the formal structure of management is not flexible enough for a variety of people, times, and conditions. In the case of corporations with widely distributed units, the formal structure may not make allowance for local customs. Company picnics or basketball teams may be so much the rule in a locality that a restriction against them is a serious detriment to employee morale.

Another reason appears to be a purely social one. People like to be with each other, to converse, to interact. Personal preferences in this respect may be based on a sense of humor, an interest in baseball, fishing, music, or on other factors not related to the work situation. The informal groups or cliques which form along such lines will not conform to the formal structure of organization and may operate counter to it, as in the case mentioned above of a friendship established in a car pool.

Informal organization within the work plant appears to perform definite functions on behalf of its members and may enhance or hinder the plans of formal organization. As suggested in the paragraph above, informal organization arises and persists because it satisfies the needs of its members. Specific needs will vary from work situation to work situation, but all groups feel a need to perpetuate themselves. It is "natural," essential, and almost inevitable that once groups arise, they do everything they can to perpetuate themselves. All customs, traditions, and folklore are assumed to be important and necessary for survival of the group, and no one questions why a custom should persist. Thus, one of the main functions of informal work organizations is to maintain whatever its members have found satisfying.

Another function of informal organization is to maintain a communication system. Once a group is established within an organization, it wants all the information that might affect its welfare. If information is not forthcoming through informal channels, the formal line of communication is tapped and then information spreads rapidly. Since the informal system of communication is so intimately connected with formal organizations, it is easy to understand why it is virtually impossible to maintain secret plans or policies. Chains of friendship span the entire work organization and the formal communication system is invariably tapped. Once established, a communication system functions to convey any information of interest to its members, ranging from official policies and plans to just plain gossip. The sudden resistance that management often encounters when it makes new proposals on wages, hours, pensions, seniority, recreation, or other plans may be explained by the fact that these proposals have already leaked out and been thoroughly discussed.

One of the primary functions of informal social organization is control, which is exerted toward its own members, toward other informal organizations, and toward formal organizations. A member is expected to conform to the customs and traditions of the group, to do a fair share of the work, not to profit at the expense of another member, and, above all, to remain loyal. Any member who does not uphold these expectations is subject to censure through a variety of techniques ranging from ridicule to violence.

The control of informal organization over its members is seen, perhaps, more clearly in its efforts to control the formal organization. Both management and union recognize that their plans, however, carefully laid, are often violated or modified by the workers, but management and the union seldom recognize that such action is often an attempt to adjust to changing circumstances as defined by the informal organization. For example, restriction of production, commonly found on all levels of industry, irrespective of occupation, frequently puzzles management and leads it to conclude that workers are motivated by nonrational sentiments rather than logic. But when viewed from the standpoint of informal organization, there is a greater amount of rationality and logic involved than is generally supposed. Management tends to see informal organization largely in the form of resistance, rarely in the form of assistance, and yet without the assistance of informal organization, formal organization often would be ineffective. This is frequently the case when managers try to determine every detail of production, for managers often are too far removed to be able to forsee many problems which arise. If their orders were followed completely, confusion would result and production would be lowered; so, in order to achieve the goals of the organization, workers must resort to their own methods and disregard lines of authority. Restriction of production, from the standpoint of informal organization, may be a matter of group tradition and persist even under almost perfect working conditions. Restriction of production may be direct or indirect, sporadic or persistent, and in cases it is related to the concept of a fair day's work. Two important rules are, therefore, that the worker should not overproduce and be a "rate buster"; neither should he underproduce and be a "chiseler." Past experience has taught workers that it is not wise to produce as much as they possibly can, and folklore provides reasons why they should restrict production. The suspicion that workers have toward speed-up schemes is a rational response to the tactics many employers have used in the past. The folklore of workers contains many stories of incentive plans that resulted in increased production with no increase in income. These ideas persist whether or not a union exists, and the presence of informal organization functions to keep sentiments alive. To maintain his place in the group the worker must conform to these sentiments.

Still another function of informal organization is to provide interest and amusement in work life. In many instances the social life of informal work groups gives people their only social satisfactions. The singing, gambling, and horseplay on the job may give the only personal recognition and attention to people who would otherwise be in anonymous surroundings. If the work is monotonous and offers no future, all the satisfactions at work must be derived from inter-personal relations, and the activities are spontaneously invented.

Knowledge of informal organization is valuable for a number of reasons. Information on interpersonal relations in industry has been recommended as an aid in checking the accuracy of the formal organization chart; as an aid in planning anticipated organizational changes; as an aid in installing managerial devices, such as budgetary controls; as an aid in solving problems of communication; as an aid in locating people who can be counted on to facilitate action and clear up misunderstandings; as an aid in learning the "right" contacts to make in order to get information or action (often the most efficient way to get something done is not to go through channels); and as aid in locating leadership material.

As an instance of how knowledge of informal organization may be utilized to the advantage of management, a World War II investigation may be cited. The government asked the Research Division of the Harvard Graduate School of Business Administration to make a study of labor-management relations in California aircraft factories, long plagued with high rates of labor turnover and absenteeism. The researchers found that those shops with low rates of labor turnover and absenteeism had a team leader, a leader who had not been elected or appointed but whom every worker in the shop acknowledged as the leader. This spontaneously arisen leader had built up production the way a good foootball coach builds a random collection of rookies into a winning team. He boosted morale, he relieved the foreman of many problems of minor discipline, he introduced new workers in the shop to their jobs and integrated them into the work group. It was found that most absenteeism and labor turnover came from workers who did not belong to a team who were not a member of informal organization. Thus they had no social life in the factory, nothing to involve their interest and loyalty. They did not "belong."

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Character In Cotton

By Gaston Gage
Head, Yarn Manufacturing Department

Editor's note:

The following paper is a general summary of facts concerning character in cotton. It was written for cotton marketing students to give them some concept of a new phase in cotton grading . It contains many facts which will be interesting to our readers.

Characteristics of cotton are those things which are not apparent to the eye or learned from pulling the staple, but must be measured with a laboratory instrument. These characteristics in cotton affect its spinability and the quality of yarn that can be made, both as to appearance and strength. Character is very important in the end use to which the cotton is to be put and is an important item in its real value.

Traditionally, the value of cotton has been based solely on grade and staple, without regard to character. By the old method of evaluating cotton, Middling 1 1/16 inches cotton always sold for a higher price than Middling 1 1/32 inches although sometimes 1 1/32 inches cotton makes a better quality yarn than the 1 1/16 inches cotton, due to better character.

For years these measurements of character in cotton were used only by the research people including the plant breeder and the United States Department of Agriculture. Recently this question of character in cotton as it affects the value of cotton is getting more and more attention in both the marketing and the manufacturing fields. In the marketing fields, the manufacturer is beginning to specify certain limits on character measurements when he buys cotton. He is also using character measurements in planning his blending program rather than leaving the blending to pure chance.

Grade and staple will continue to be of prime importance in marketing cotton. Staple length as a general rule is a major item in value of cotton and will continue to be. Grade will also continue to be of major importance because it is a good indicator of the amount of waste that must be removed and color is important as it affects the quality of the product and its end use. Also, color may give a clue to character, as the yellow colors are generally symptoms of poor character.

There is room for improvement in the instruments used to measure character, but until this improvement comes about, what we have will suffice. The manufacturers do not agree on what combination of characteristics are most desirable. They will have to decide this. Then the plant breeders will have to produce a variety of cotton with these most desirable characteristics.

Marketing cotton by character as well as by grade and staple will complicate the marketing procedure. Contract specifications will have to be worked out and standards set up. Then machinery will have to be devised to settle disagreements between buyer and seller.

A new basis of premiums nad discounts will have to be worked out. Now grade and staple are the only points taken into consideration in deciding on premiums and discounts.

There follows a description of fiber qualities which require laboratory instruments to measure them and the instruments used.

1. **Fiber Length and Uniformity.** Fiber length has always been taken into consideration when the cotton classer stapled the cotton. But there is something to length besides what the classer calls.

One instrument generally used to measure length and uniformity is the Fibrograph. It was developed by Dr. Hertel at the University of Tennessee. A sample of cotton is combed out so that the fibers are reasonably parallel, with two combs. This leaves the ends of the fibers sticking out from the combs. These fiber edges on the combs are moved through a beam of light. The more uniform the fiber lengths, the more regular the shadow. The machine operates so that this shadow is projected as a curve and a formula used to convert to uniformity and fiber length.

This instrument measures (a) the average length (b) the upper half mean length and (c) the length uniformity ratio.

The "upper half mean length" as measured by the Fibrograph is to all intents the same length as that called by the cotton classer when he pulls the staple. This had been determined by numbers of checks. The Fibrograph is much slower than the cotton classer in getting this information. A cotton classer can staple about 300 bales of cotton a day while a laboratory technician can work only about 50 samples on the Fibrograph.

The "upper half mean length" is the most important of the length measurements. This length is the most important item in determining how fine a yarn cotton can be spun into and also its strength. But this length is not the only item as will be seen later.

This "upper half mean length is the only item of length that is very important in spinning yarn from carded cotton. In the case of long staple combed cotton, the "length uniformity ratio" is important in that the amount of comber waste is determined by this item. The more uniform the cotton, the less waste will be removed on the comber.

The "average length" as determined by the Fibrograph apparently is of no value, the information having no practical use.

The variety of cotton planted is the chief determining factor in fiber length. A variety of cotton that normally produces 15/16" cotton is never going to produce 1 1/16" cotton, regardless of how favorable the growing conditions.

Other factors affecting length are moisture, season of growth, and soil and fertilization. As shown by experiments with irrigated cotton, the more the moisture, the longer the staple length. Of course this covers a rather small range and with excessive moisture a limit is reached. Also, late pickings of cotton show a slightly shorter length than earlier pickings This is attributed to shorter periods of sunlight and cooler nights. Better soil and fertilizer will show a slight increase in length.

The reason the longer staple gives more strength is that the strength of yarn depends partly on the drag between fibers. Cotton yarn is made up of relatively short cotton fibers laid parallel to each other and twisted together. When you break a piece of cotton yarn, there is some fiber breakage and some fiber slippage. The longer the staple length, the more the overlapping and consequently the less slippage.

Also as a general rule, the longer the staple length, the finer the fibers. Thus, for the same yarn number, there are more fibers per cross-section which adds to the strength of yarn. The same things that add to the strength also make possible the spinning of finer yarn.

Another method of measuring fiber uniformity is the Suter-Webb Sorter. This is a slow hand method of sorting the different fiber lengths in a sample on to combs. From this a curve showing the various fiber lengths can be plotted. This gives a result comparable to the "uniformity ratio" obtained on the Fibrograph. It is generally agreed that the more uniform the staple length, the better the appearance of the yarn. Irrigation studies show that the uniformity increases with the moisture during growing. Uniformity is also a varietal characteristic.

2. **Fiber Fineness.** Fiber fineness is getting more and more attention as one of the fiber qualities that affect the value of cotton. It is important in determining the strength of yarn, the appearance of yarn and the numbers into which the yarn can be spun and the maturity of the fibers.

The instrument commonly used to measure fiber fineness is the Micronaire. This instrument works on the principle that the finer the cotton fibers are, the closer they will pack together and the more resistance they will offer to a stream of air passing through. It measures the resistance of air flow under standard pressure through a standard weight of 50 grains of cotton in a standard sized cylinder with a standard perforated plug.

The Micronaire tells nothing about the shape of the fibers or whether some of the fibers are coarse and some fine or whether they are all one size.

The higher the Micronaire reading, the coarser the fibers. Thus, since short staple cotton is almost always coarse fibered cotton, short staple cottons have higher Micronaire readings. There are some few exceptions to the rule that the longer the staple the finer the fiber.

Fine fiber contributes to yarn strength, especially for fine yarn numbers, because the fine fibered cotton means more fibers per cross-section and this gains in importance as the yarn gets finer.

Fine fibers have to be processed slower on the card than coarse fibers to avoid fiber damage at this process. This means that the manufacturing cost increases on fine fibered cotton.

Fine fibered cotton is more prone to make neps than coarse fibered cotton and neps are undesirable. The coarser fibered cottons tend to make better appearing yarn.

The Micronaire does not differentiate between fibers that are fine due to their varietal nature and the ones that are fine due to immaturity. If the fineness is due to immaturity, the product is of poor quality from the point of strength and dyeing qualities. Immaturity is that condition when the hollow inside of the fiber does not fill out properly, causing the fiber to be weak and to take dyes differently.

As fiber fineness is a varietal characteristic, if the variety of the cotton is known, and the area of its growth is known, the Micronaire reading may be used to interpret maturity. Weather conditions and soil have some effect on fineness. Irrigation studies show that extremities of dryness or moisture give a finer fiber than medium amount of moisture.

The Micronaire is fastest, least subject to error and most economical of all the fiber measuring devices.

3. **Fiber Strength.** Fiber strength is an important characteristic of cotton as it has great influence on both the strength and appearance of yarn.

The Pressley Cotton Fiber Strength Tester is an instrument for testing fiber strength. It takes a flat ribbon of about two milligrams of cotton. This ribbon is clamped between two pairs of jaws like two small vises. The ends that extend beyond the jaws are cut off so that finer length does not enter into the weight of cotton broken. A weight is then run out a beam, this weight pulling on the ribbon of fibers in the jaws. When the fibers break, the weight stops. The pounds reading on the beam is then taken and the broken fibers recovered and weighed in milligrams. This weight and the pounds per square inch which is the term used to express strength of cotton fibers.

There are other instruments on the market which measure this same break. Dr. Brown and Professor Graham, of the Clemson School of Textiles, designed one and it is being manufactured. It uses a stationary pendulum instead of a beam which gives a fixed rate of loading, avoids overshooting and gives a graph to show stretch.

Fiber strength is second only to fineness in determining strength of yarn in cottons less than one inch in staple length. Fiber strength is first in determining strength of yarn in cotton whose staple length is from one inch to 1 3/16 inches. A difference of 5 to 6 thousand pounds in breaking strength of fibers is equivalent to 1/32 of an inch in fiber length in adding to strength of yarn.

The stronger fibers, other characteristics being the same, make it possible to spin finer yarns.

Cotton with high fiber strength does not have as many neps in the web as weaker cottons, every thing else being the same.

So the value of strength in cotton fibers varies with the end use, the yarn numbers to be spun and the staple length of cotton. In some instances, it is a valuable asset. In other cases the value is negligible.

Irrigation studies show that cotton grown with less water is stronger than cotton irrigated more often. This is especially true in the case of the first picking, far less pronounced in the case of the second picking. In fact, the difference is hardly significant in the case of the second picking.

4. **Maturity.** Cotton fibers grow in the form of a round hollow tube. The first growth of the fiber is in length, then a week or ten days before the boll is to open, the fiber starts to build up on the inside with a cellulose lining. Anything that interferes with this results in immaturity. Whether cotton is mature or immature determines partly its value as a fiber.

There have been developed several methods to measure maturity. The most commonly used method is to look at a cross-section of the fiber with a microscope. If the lumen (hollow inside the fiber) is less than twice the thickness of the fiber wall, it is a mature fiber. If it is more than twice the thickness of the fiber wall, it is immature. The different fibers—mature and immature—are counted and the per cent relationship between the mature fibers and the total fibers under observation is the per cent maturity. The skill, experience and judgement of the operative and the adequacy of the sample govern the accuracy of the measurement.

Another test is the Caustic-aire test. This test uses the Micronaire. The sample is first tested for fineness. Then the sample is treated with caustic to swell the fibers. Then it is dried and checked again for fineness. The relationship between the two tests indicates whether the fineness is a natural condition of the fibers or whether the fineness is due to immaturity.

Other methods not commonly used are the dye tests and the bundle test.

Immature fibers are weak fibers. Therefore immature cotton makes weaker yarn, but there can be exceptions. Sometimes some immaturity in coarse fibered cottons adds to the yarn strength because it adds to the fibers per cross-section in the yarn.

The appearance of yarn and cloth suffers in the case of immaturity because immature cotton is one of the chief causes of neps in the card web.

Immature fibers take dye differently from mature fibers. Therefore when yarn or cloth is to be dyed and the sharpness of the dyeing is of paramount importance, immature cotton can not be tolerated.

Fiber maturity ranges from a low of about 60 per cent to a high of about 85 per cent. Average maturity is between 70 and 75 per cent.

Anything which stops the growth of the fibers causes immaturity. Boll weevil infestation may cause immaturity by stopping the growth of fibers around the boll weevil puncture. Frost stopping the growth of the plant will cause immaturity because the fibers do not develop. Both of these things cause yellowness in the cotton so this yellowness can be taken as a symptom of immaturity. Generally speaking, anything that interferes with the continued growth of the fiber, including starvation, will cause immaturity.

So what is the result of all this? The only answer is, it all depends on the yarn numbers to be made and

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what the yarn is to be used for. In one case, a certain characteristic is very desirable, under other conditions its value is negligible.

It will cost more to sort the cotton into even running lots by character as well as grade and staple. Do the gains justify the cost? In some cases yes, in others, no.

As the characteristics tend to be largely controlled by variety planted and where grown, chance blending will not always suffice. The manufacturer is now using his character measurement largely to get a uniform blend. This makes certain that he is never feeding in at one time a lot of cotton with undesirable characteristics for what he is making, but rather feeding in cotton uniform in character as well as grade and staple.

More and more cotton is being bought by mills with fineness specifications in the contract. Some cotton is being bought with strength specifications. When these are put in, the cotton will necessarily cost more. As yet there are no standard premiums. As more and more mills begin to put character specifications in their contracts, the ones who do not do this will get nothing but rejects and dregs, so they will be forced to the same policy.

Then some method of settling disputes between buyer and seller who disagree over these measurements will have to be established. There already is such a body to settle disagreements as to grade and staple.

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Growing Pains

W. T. Linton, Executive Director
Water Pollution Control Authority and Director
Division of Sanitary Engineering

The textile industry in South Carolina is one of the more substantial economic factors sustaining and improving our way of life. We have in the South developed a sense of proprietorship and pride in the textile industry sometimes without due consideration to the many problems which confront this important industry in its period of expansion and attendant "Growing Pains."

The causes contributing to the intensity of these growing pains are myriad, and they must be evaluated and controlled if the industry is to continue to make its significant contribution to the public well-being and at the same time operate at a level which will motivate the desire of management to undertake and accomplish an orderly program of expansion designed to meet competition within the industry and provide a useful, attractive and necessary product for the markets of the world.

There is one symptom of the "Growing Pains" in the textile industry coming into outstanding importance at an alarming rate of speed and if allowed to develop without proper diagnosis and control will result in a debilitation from which complete recovery will be questionable. This symptom includes the sometimes indiscriminate utilization of our natural resource—water. Since water, along with food and air, is a necessary requisite to our existence and is playing a more important part in the expanding economy of our people, we must of necessity give added consideration to the conservation and proper utilization of this natural resource.

Recent world events have pointed up with shocking emphasis the importance of one water use in the philosophy of nations of the earth. Deprived of the transportation water affords by simple existence and location, national economies suffer, ways of life are changed, economic strata are depressed and wars are waged. The many uses of water other than transportation are just as significant when we consider the areas and people served as a universe. In satisfying the needs for water, quality as well as quanity, must be given consideration. Thus it becomes evident that for the many and varied applications of water use, control must be exercised to the extent that no one water user can be allowed to deprive any subsequent user of his rights thereto.

How the textile industry is involved in the problem of water use within South Carolina certainly is obvious to that portion of the industry with experience in expansion. However, there is, I am sure, a very small number of people who realize the many problems faced by this expanding industry in the matter of waste disposal. All waste must be disposed of to the environment and the waste from textile operations is no exception. Think for a minute of the complexities of any one textile operation presenting a waste problem then multiply this by an indefinite number of variations of waste constituents, concentrations and fluctuations in discharge rates of various chemicals to surface streams which are never constant and you have stated the original conception of only one of the pains experienced in growing. To disregard the implications imposed on an expanding industry by lack of admission that waste treatment poses a problem worthy of consideration denies the existence of law requiring that pollution of our precious water supply be prevented and admits inadequate, immature, and faulty judgment in the formation and prosecution of a program which, if it is to succeed, must have continuing progress and expansion as an integral part. Only in this philosophy of progress can we continue to experience the exhilaration of "Growing Pains" and look with hope to the future. Without this philosophy the future is now. The growing is ended and only the pains are left.

South Carolina cannot afford to express its devotion and appreciation to her past generations by doing less for posterity than was done for us.

WE MUST GROW in — W - isdom
A - ptitude
T - olerance
E - nergy
R - everence

if we are to prepare a worthy salutation to the future.

Scholarships and Financial Aid

William C. Whitten
Chairman, Student Awards Committee

The students enrolled in the School of Textiles are fortunate, among other ways, in that the textile industry has provided financial aid to needy students in amounts greater than any other school on the campus. Of course it is desirable that the amounts of financial aid be even greater—and it is growing—but we can be thankful for what we have and appreciative to those who are providing this help.

Up until the last month, all of these scholarships were awarded principally to juniors and seniors; only one was available to sophomores and none to freshmen. There is certainly reason to see why this was true. Most of the awarding companies feel that a student should prove himself in college for a period of time before eligible for financial aid. On the other hand, it can be argued, I believe, that a man who has put in a successful two or three years in college (that is, one who would be a good prospect for a scholarship), would see the value of completing his education and would somehow make sufficient effort to provide finances. Many studies have shown that a good percentage of high school graduates are not attending college when they are, in reality, fully capable of fulfilling college requirements. They are not attending either because of financial difficulties or disinclination to attend. With an almost certain prospect of future labor shortages, and particularly trained and skilled labor, it would seem highly important that this segment of the high school population be aided (if necesasry) to gain further education and training. (The group who are simply disinclined to attend college should be ignored until their viewpoint changes, it seems doubtful if their accomplishment would be worth the expense.)

Within the last month, the college has been informed that for the first time a company is wishing to grant annual scholarships to freshmen (two $500 ones). As this is being written, no program of selection has been set up but will soon be.

Most of the scholarships are awarded on the basis of scholastic ability, need, leadership potential, evidence of good character or some combination of these features. Though a few do not consider financial need, most make this one of the factors for consideration.

Some of the companies or organizations granting scholarships of all types which are available to textile students are the following:

American Association of Textile Chemists and Colorists
American Enka Corporation
American Viscose Corporation
Blackmon-Uhler Corporation
Burlington Industries, Incorporated
Celanese Corporation of America
Ciba Company, Incorporated
Dow Corning Corporation
Interchemical Foundation
Keever Starch Corporation
Leon Lowenstein Foundation
Owens-Corning Fiberglas Corporation
Seydel-Wooley

In addition to these which are awarded by the college student aid committee, are scholarships which are granted by companies directly and usually to students in the city in which the company is located. These scholarships, directly awarded, most probably constitute a larger sum than we have to award. An additional factor here is that these awards are often available to entering freshmen. Persons in need of financial aid should make inquiries in their community as to the availability of such grants.

In addition to outright grants, there are a number of loan funds both by the college and by industries of the state. Of course, these have to be repaid, but at little or no interest.

Also the college has a few jobs which are filled by student help. The Director of Student Aid should be contacted concerning this. He also can locate outside jobs at times for some.

For some reason there exists a hesitancy on the part of some students which keeps them from seeking scholarships and other aid. If you can't qualify, of course, there is no use in wasting anyone's time, but if you feel you have any chance at all then don't hesitate (and don't keep putting it off either). You never know what the qualifications of the other applicants will be.

Finally, I would recommend to prospective students that they seriously consider the financial aid that can be acquired by participation in the ROTC program. It is no small change, and is outlined in the college catalog.

If a student is a good student, I don't believe that the faculty and administration will fail to find some way for him to overcome financial difficulties in order to remain in college.

Guest Editorial

Dr. R. F. Poole, President

Clemson College, Clemson S. C.

The textile manufacturing industry is an important part of the economy of South Carolina. It helps to finance the cost of and maintain a sound state government and provides employment for many of our good people. It is conceivable that it will continue to prosper but at other times it may feel the effect of keen competition and changes in home and world markets. South Carolinians may well be concerned about the welfare of textile manufacturing and indeed about the cotton industry as a whole. The producers of cotton in recent years have been confronted with less income from their product and by rising costs of materials essential to cotton production.

Important as these changes and fluctuations may be they should not deter those who are interested in receiving an education through study of the curricula offered in textiles. Along with excellent basic education in chemistry, mathematics, physics and English a student in the textile courses is given practical knowledge which will enable him to do excellent work in the textile industry or in the many allied fields.

Just what position a graduate secures in the industry will depend upon his total qualifications. Able professors may inspire and teach essential facts about textiles but these men cannot do everything for a student. He must learn for himself the fine points of a winning personality and discipline his working time to achieve success. The smart student will watch for every opportunity to broaden his education and will take advantage of his time to prepare himself as thoroughly as possible to meet the exacting needs of the cotton industry.

Clemson graduates in textile curricula, especially in textile engineering, are making names for themselves and at the present time Clemson cannot meet the demands for graduates. Fortunately the textile interests need college men who are well trained and who possess qualities of leadership. For the most part these men are privileged to live in the southern states.

Economics and Textiles

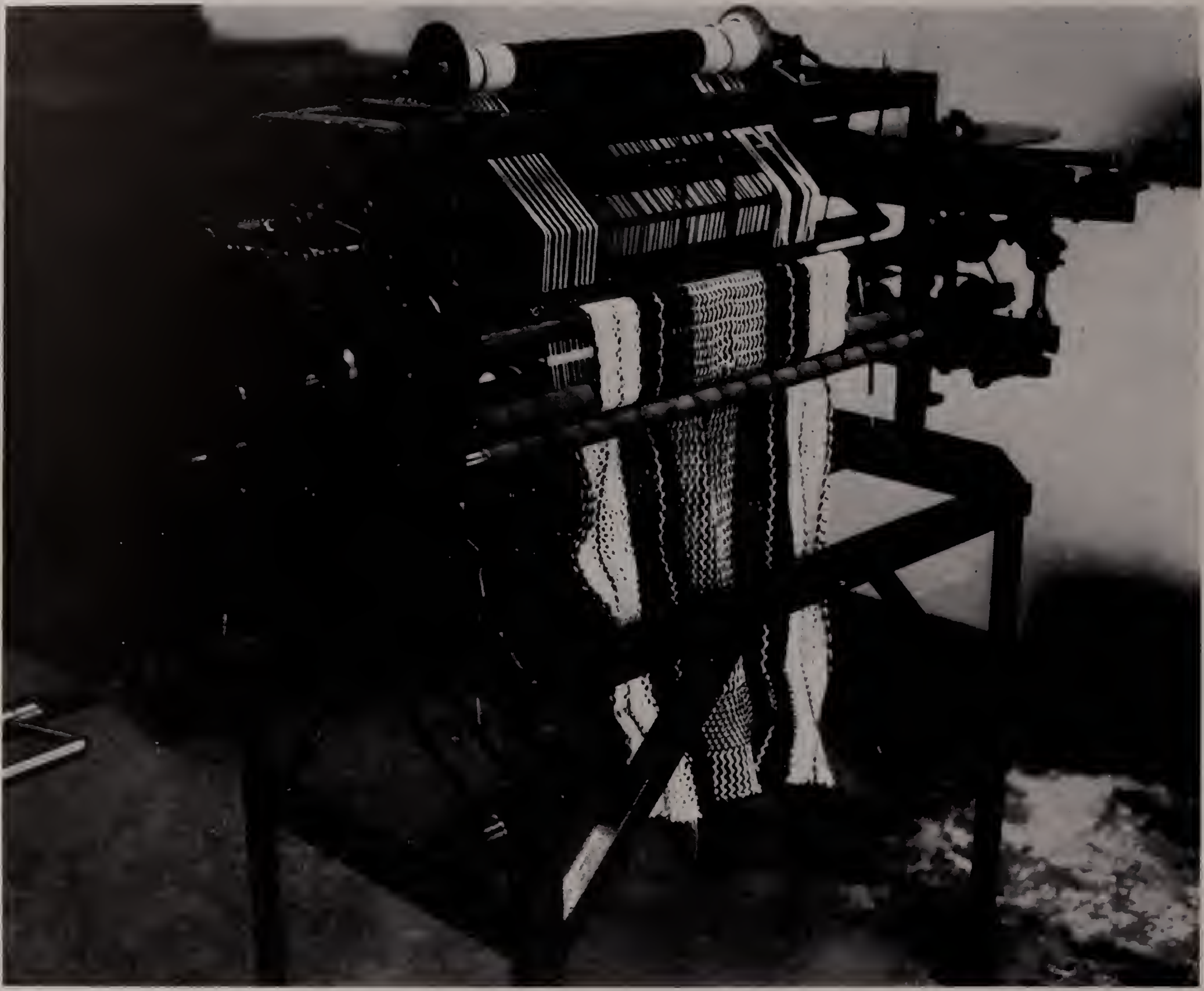
By E. J. McVEY, Vice President
Saco-Lowell Shops

The current complexity of the problems facing our national textile industry makes it extremely difficult to accurately predict the level of activities for the textile machinery industry through 1957. The activities of the textile machinery manufacturer in the past have always been closely related to the spinning and weaving mills. Statistics and experience have shown that when the mills are operating on a profitable basis and have a surplus of funds they then show an interest in machinery and equipment which will increase their production, lower their costs or improve their cloth.

However, under the conditions prevailing at this time, we sense a tendency of the mills to inaugurate betterment programs with a certain degree of caution as they all seem to recognize that the variables in world conditions which will affect their operations, must be carefully and accurately evaluated. Most of these variables are economic or political in nature and their eventual solution will no doubt affect the textile industry in the overall picture. Naturally, there is grave concern over the increase in export of textiles from the low wage countries in the Far East and elsewhere, operating in many instances on low cost raw materials locally grown. In spite of these incipient sources of troublesome conditions, there are several compensating factors. First, for instance, we have a steady increase in our population together with a tendency towards a definite improvement in the standard of living. This growing population is calling for more sheets, pillow cases, towels and other domestic textiles than ever before. Our heavy industries in spite of the influx of paper or similar competitive materials, continue to increase their consumption of needed woven and twisted textiles at a satisfactorily increasing rate. The number of spindle hours per month continues at a very high level throughout the industry. Our progressive corporations are spending significant amounts of money in research and development seeking ways to make better fabrics at a lower cost and to increase the consumer's consciousness in textiles so that the industry will earn its proportion and share of the consumer's dollar. One of the most encouraging and significant aspects for 1957 is the willingness if not eagerness of mills both large and small to seek the developing and finalization of improvement plans both on a long and a short range basis.

One of the encouraging results of these fact finding and research programs seems to be the willingness of management to gradually depart from the old benchmark so long used in appraising the value of new textile machinery. For many years the value of new equipment was based upon the return on the investment regardless of any other result of the mill's prosperity. Today, the advantage of new machinery is in many cases no longer judged by this yardstick but by the results the new equipment produces in the way of better quality and lower cost. Smart aggressive management is no longer willing to sit complacently around while their equally smart and aggressive competitors are capturing part of their market because of lower costs and better quality in their competitors' fabric. Their competitors are able to make better goods at lower cost because they have taken full advantage of the technological advancement in new machinery which has brought about a definite increase in the production per man hour. Financial circles are now willing to concede that lower cost and better quality are equally as important as a gross return on the investment. Management is beginning to realize that obsolescence is a creeping sickness like a cancer or high blood pressure and that unless steps are taken to arrest its progress the time will come when liquidation will be a prime subject of discussion. Thus, it is necessary to forget about the return on the investment and to concentrate on the advantages accruing from better quality of production, more production per man hour, lower cost per pound and higher recovery of raw material.

These are the benchmarks of which successful management must judge its new equipment and not by an obsolete benchmark. Now, as more and more mills improve their operations and consequently their competitive position through the acquisition of new machinery, the burden on the management of mills with obsolete or semi-obsolete machinery will continue to become heavier and heavier and will no doubt soon reach a point where even the most conservative management must realize that his mill can no longer drift and expect to "buck" the "current" of progress. For this reason it is our hope and prediction that 1957 will be a year with better than an average level of activity for textile machinery manufacturers, because there are more than fifteen million spindles and a corresponding amount of preparatory machinery on the way to rapid obsolescence, and it is the replacement of this equipment that holds a promise for the textile machinery manufacturers.



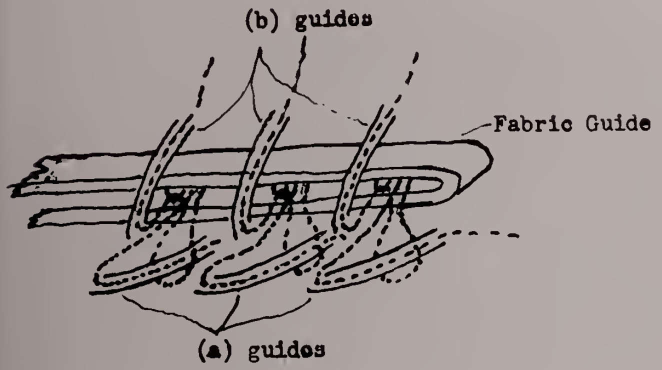
Clemson Develops New Method of Knitting

T. D. Efland, Associate Professor
Hugh M. Brown, Dean
School of Textiles

Carrying out ideas of Professor T. D. Efland and Dean H. M. Brown, a new method of knitting has been developed at Clemson. Using the new principles, Professor Efland has engineered and designed a working model for knitting 24" fabric. The novel feature of the machine is that the usual needles having beards and latches are not used, the knitting being accomplished entirely by the use of yarn guides.

The yarn guides are tubular in character, mounted in two warp bars working adjacent to a slotted fabric guide which serves to keep the fabric centered between the two sets of yarn guides and also to slip the loops free of either set of guides alternately at the proper time in the cycle. The warp bars, yarn guides and fabric guide can be seen in the photographs.

Figure 1 shows a few guides. The (b) yarns are shown passing through guides (b) entering the edge of the fabric guide and thence around the yarn guides (a) and re-entering the fabric. In the next part of the cycle the yarn guides (b) will pass under the yarns from the guides (a) forming loops of yarns (a) around the guides (b). The guides (a) will then be withdrawn from the loops shown around them in the figure. The whole cycle will then be repeated in similar fashion by yarn guides (a) passing under the yarns coming from the guides (b). Thus, there is always a set of loops on one or other set of yarn guides.



While the yarn guides of either bar are withdrawn the bar can be shifted laterally with respect to the other bar any number of ends before passing under the yarns from the other bar. This lateral shifting of one bar with respect to the other is accomplished with a cam operating on the end of a shaft which carries the upper warp bar. Though it is possible to have a machine on which either warp bar may be shifted, it seems practical to do all the shifting with one warp bar.

Not only is it possible to shift one warp bar when its yarn guides are completely withdrawn from the loops but also it can be shifted when the tips of the yarn guides have engaged the opposite set of yarns. Thus the yarns of one bar may be shifted laterally either way with respect to their last position in the fabric and also the yarn guides on one bar can be used to carry loops of yarn from the opposite bar laterally in either direction so that both (a) yarns and (b) yarns can be simultaneously shifted from their last position in the fabric.

It is obvious that a large variety of patterns can be produced since either type of shift (or both types of shifts) can be used at will in either direction. The pattern can be made still more complex by changing from one pattern to another for any number of courses as the knitting progresses, producing a crosswise band effect. It is believed that many of the fabrics knitted by this method cannot be produced by the usual knitting machines. The fabrics knitted by this machine more nearly resemble some crocheted fabrics.

The machine especially lends itself for wide guage material but built with precision design it may be possible to knit rather finely meshed fabrics. Even with a course mesh machine by carrying the loops of yarns laterally on the inside of the fabric, heavy, dense character fabrics are made. On the other hand, rather open fabrics with great elasticity in both directions can be created.

The machine is only in the experimental stages in more or less a mock-up form and it remains to be seen what speeds of production can be had, how fine a guage would be practical and what various uses may be for the fabrics.

Acknowledgement should be made to the Sirrine Foundation. This development was only possible by Sirrine funds which enabled Professor Efland to carry on this work during the summer months.

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Outstanding Seniors

James Kenneth Rogers, a Textile Manufacturing student, was born in Liberty, S. C., and he and his wife are presently residents of that community. Unlike the majority of Clemson students, he will anticipate entering the textile field immediately and permanently since he has already fulfilled his obligation of serving time in the Armed Forces.

Ken is a member of Phi Eta Sigma, a scholarship fraternity, and is currently being initiated into Phi Kappa Phi, a national honor society.

Ken has had seven years of mill experience as a loom fixer and his choice of mill work concerns production or management.

Isam E. Ballenger, known to the students as "Dicky" is a Textile Chemistry major from Inman, S. C., Dicky is a very versatile person in that he readily applies himself to any new task.

During his stay at Clemson he has participated in many extra curricular activities. These include being Secretary of the Student Body (Junior year), and YMCA Councils (Sophomore, Junior and Senior years). At the present he is Vice-President of the YMCA Cabinet, Co-Editor of the YMCA Handbook, Program Chairman of the Baptist Student Union, Student Chaplain, Corresponding Secretary of Blue Key, member of Tiger Brotherhood, and a member of the American Association of Textile Chemists and Colorists. In ROTC he has the rank of Cadet Captain.

Dicky received honors for his junior year and was this year elected to "Who's Who in American Colleges and Universities."

Dicky will finish in June and plans to enter his field of Textile Chemistry until his two year period of service comes up.

Edward F. Puryear, a Textile Manufacturing major, was born in Athens, Alabama, but now makes his home in Cheraw, S. C.

Since Edward is a veteran of the Korean War he is a member of Clemson's Veteran's Club. He is also Senior Warden of Phi Psi—the textile honor fraternity, and a member of Phi Kappa Phi—a scholarship fraternity. During the time he has been at Clemson, he has received honors 3 semesters and high honors one semester.

Upon graduation he plans to enter the textile field immediately.

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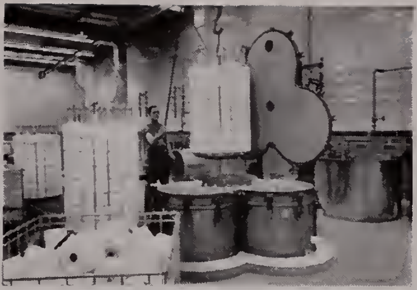

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Faculty Members Attend American Viscose Seminar

During the summer seven of our textile school staff attended the Fourth Seminar for Textile Institute Faculties at American Viscose Corporation, Textile Research Department, Marcus Hook, Pa. Those were: Profs. T. A. Campbell, Jr., J. C. Hubbard, Jr., L. H. Jameson, J. H. Langston, J. H. Marvin, J. L. Thompson, and C. V. Wray. This was the largest delegation of any textile school represented.

Talks were given by several members of the American Viscose research staff. Their subjects were as follows:

"Rayon Outgrows Style" by Mr. R. MacHenry, Industrial Division.

"Super Rayon for the Tire Trade" by Mr. A. B. Baker, Tire Yarn Technical Sales.

"Rayon-Cotton Blends" by Mr. W. K. Simons, Staple Technical Sales Division; Mr. R. Bounet, Textile Development Branch; Mr. I. H. Welch, Dyeing and Finishing Division.

"Application of Solution-Dyed Yarns" by Mr. L. L. Walmsley, Dyeing and Finishing Division.

"Nylon Acetate Tricot Fabrics" by Mr. J. M. Roughan, Consumer Division.

"Developments in Warping of Filament Rayon" by Mr. G. W. Byers, Mr. G. A. Glarner and Mr. J. A. Roberts—all of the Weaving Division.

"Testing and Testing Methods" by Dr. C. O. Werner, Technical Records Division.

"Styling of Rayon and Acetate Fabrics" by Mr. R. Bounet.

"Wash and Wear and Other Durable Finishes for Rayons" by Mr. I. H. Welch, Dyeing and Finishing Division.

"Tufted Carpets—The Problems and Solutions" by Mr. W. K. Simons, W. A. Staners, R. L. Stimmel and K. L. Whitney, Staple Technical Sales Division.

"Testing Fiber Friction" and "The Lindly Yarn Inspector" by Mr. R. D. Heffelfinger, Mechanical Development Branch.

"Present Dyeing Procedures for Rayons and Acetates" by Mr. J. A. Woodruff, Dyeing and Finishing Division.

"Current Status of the Non-Woven Fabric Industry" by Mr. H. E. Shearer, Industrial Division.

In adition to the above talks and discussions pertaining thereto there were tours over the various divisions of the research department so that first hand observation could be made of the work being conducted.

From the remarks of the faculty members this was a very worthwhile seminar. Also that it would be most enlightening if other textile concerns would have meetings of this nature.

S. C. POINTS WAY IN EMPHASIZING THE IMPORTANCE OF TEXTILE EDUCATION

(Continued from page 7)

cause it is from the industry that lecturers must come to cover the various subjects involved in this series.

At the dinner meeting on November 13, Mr. Marion W. Heiss, Vice President of Cone Mills Corporation, and immediate past president of the North Carolina Textile Manufacturers' Association, declared that the future health of textile colleges and of the textile industry would be shaped by the caliber of those graduates which make textiles their career. In emphasizing the importance of quantity in the total picture, Mr. Heiss was particularly careful to point up that quality in these graduates is imperative. Mr. Heiss recommended very strongly that students be given a better concept of merchandising, knowledge of cost efficiency, and the economics of manufacturing. In addition, he stressed the need for better training in public speaking, human relations, and other related problems.

At the luncheon on November 14, Mr. J. Spencer Love, Chairman of Burlington Industries, sounded the clarion call for new optimism throughout the textile industry by predicting a "real upswing" in the textile industry during the next ten years. Mr. Love complimented the textile industry of South Carolina and Clemson College for having taken the lead in emphasizing the importance of over-hauling the industry's wrongway public relations program.

Mr. Love stated that "We are approaching a period of balanced supply and demand between the three shifts and the growing population and the passing of the marginal mills. In a decade there will be a start of a new mill building program. Within ten years you will see the boom days again in this industry.

"Even in hard times, there is a paucity of good men. The opportunities of our industry are greater than ever before."

In my opinion, the greatest single problem facing the textile industry today is the impending shortage of young men who have the potential to develop into the future leaders of the textile industry. The differences in operating costs between efficiently operated and marginal mills is greater today than in any previous time in the history of the textile industry. If we are determined that the textile industry of the future will continue to be progressive in offering young men career opportunities unexcelled by any other industry, then we must all face up to the importance of proper training in the colleges of America, not only in our textile schools, but in all other formal instruction, whether it be liberal arts or professional.

I repeat that it is very stimulating to note that South Carolina is taking the leadership in recognizing this problem and in doing something about it.

The New Sirrine Library Is Now Open

Hugh M. Brown, Dean
School of Textiles

Three years ago, the Sirrine Foundation provided for a textile library as a sub-division of the main library at Clemson College. Funds were provided for the purpose of employing a librarian and an annual allowance of $1000 for new books and library equipment.

Due to the lack of space for the various functions of the College, the area for the library in the Textile Building had to be used for other purposes. With the completion of the Agricultural Center last spring, the space for the textile library was made available. This provides a floor space of approximately twenty-four by sixty feet for a main reading room plus an ample area for a librarian's office and a small work-room. The room has been redecorated with a new cellotex ceiling and an asphalt tile floor. The walls are a satin finish light green with the upper portion and ceiling in eggshell white. The trim of the room and new draperies are rose-beige in color which gives a pleasing aspect with the green walls and sand-color floor. The room is equipped with excellent oak tables, chairs and book cabinets done in a soft finish natural oak. The book cabinets are of counter-height, giving the room an open spacious effect. These cabinets project into the room dividing it into alcoves and also will be used for the storage of all books, making the usual book stacks unnecessary. The tables are a beautiful pedestal type, thirty-six by ninety-six inches. All of the furniture except the chairs was made in the College Services Woodshop and the quality of this work is such that they can be proud to have it on exhibition in the library. Lovely potted plants have been donated by one of the professors which greatly add to the pleasing attractiveness of the room.

The room is amply lighted with new fluorescent tube fixtures making the room one of the best reading and study areas on the campus.

We are gratified that the students are making more and more use of the library during the day and arrangements are being made to have the library open during the evenings as has been requested by a large number of students.

During the past years, a considerable number of books have been purchased and, in cooperation with the College Librarian, are being catalogued according to the Library of Congress cataloging system. All of the general textile publications are available in both libraries and bound volumes are available back over a period of years, together with an index for each year. The Journal of the Textile Institute extends back to 1932.

The librarian, employed three years ago, is Miss Lois Reiss, who is very helpful to the students in the library and who has been aiding in the publication of THE BOBBIN & BEAKER. Inquiries concerning books and trade journals in the library should be addressed to her.

Miss Lois Reiss

NEW MEMBERS OF PHI PSI

The Iota Chapter of Phi Psi recently took in fourteen new members. Membership in the fraternity is based on the student's class standing in the the Textile School; students in the upper third of the Senior Class, upper fifth of the Junior Class, the top two men of the Sophomore Class are considered for membership. The new members pictured above are (from left to right):

Row 1: B. M. Kimmel, W. A. Rush, T. F. Thrushton, D. E. Norris
Row 2: B. B. Pratt, R. K. Hall, W. R. Lewis, J. P. Campbell
Row 3: W. H. Dill, W. L. Reed, R. G. Revis, O. B. Martin
Row 4: D. H. Logue, D. S. Bratkowsky

This year's project is selling towels with "Clemson Tigers" woven in the center. These towels are sold with the hope of adding new furniture to the Phi Psi Room. Inquiries concerning the purchase of these towels should be addressed to L. T. Runge, THE BOBBIN & BEAKER, School of Textiles, Clemson, South Carolina.

Interviews

To aid students in their interviewing, THE BOBBIN & BEAKER has initiated the policy of publishing interview dates for several months ahead. Also, Alumni of the College may receive the placement bulletin by writing to D. G. Hughes, Director of Placement, Clemson College.

The interview dates listed below are not all the companies visiting the campus, as many textile companies are reluctant to schedule interviews far in advance. The lattest listings can be obtained in the Placement Office. Those listed below are confirmed on the dates shown.

February 12: Fieldcrest Mills
February 15: Vanity Fair Mills
February 18: Woodside Mills
February 19: Wood side Mills
February 20: U. S. Rubber (Textile Division)
February 21: U. S. Rubber (Textile Division)
February 22: Deering Milliken Corporation
February 28: Dan River Mills
March 1: Dan River Mills
March 13: Celanese Corporation
March 14: Celanese Corporation
March 19: United Merchants & Manufacturers
March 20: Mobasco Industries
March 26: Burlington Industries
March 27: Burlington Industries

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MEMBERS OF THE SIRRINE FOUNDATION (left to right) Robert Chapman, George McClenaghan, J. A. Lyons, J. K. Cauthen, C. A. Gibson, Dr. Hugh Brown, George M. Wright, W. S. Montgomery, W. H. Beattie, C. B. Hayes.

Sirrine Foundation

To make it possible to have a highly qualified staff in the School of Textiles, an industry-supported foundation was established during the war. The funds in this foundation have been contributed by the textile companies in the State and now total nearly one million dollars, which figure is expected to be exceeded soon. The income from this large fund is used exclusively for the School of Textiles at Clemson primarily to improve the teaching staff. Under the present plans, th textile school is benefitting in five ways: (1) Enhancement of the retirement payments by the State for all members of the staff retiring with the rank of associatet or full professor; (2) The Foundation contributes half of the salary for an "extra professor" in each of three departments. The additional faculty members have research projects but take classes for short periods to enable the regular teachers to visit mills, attend conferences, etc. (3) The Foundation greatly increases the travel funds to facilitate visitation and study of the mills in the State (4) Foundation funds have been contributed for maintaining a textile division of the Library in Sirrine Hall. The contributions provide for the salary of a librarian an an annual allotment for books and equipment for the library. Ample space with excellent lighting and attractive furnishings is devoted to this subject; (5) The Textile School magazine, THE BOBBIN & BEAKER is also under written and partially supported b ythe Sirrine Foundation.

Twice a year a committee of the Foundation meets and advises with personnel of the school to find ways to promote the quality and standing of the school.

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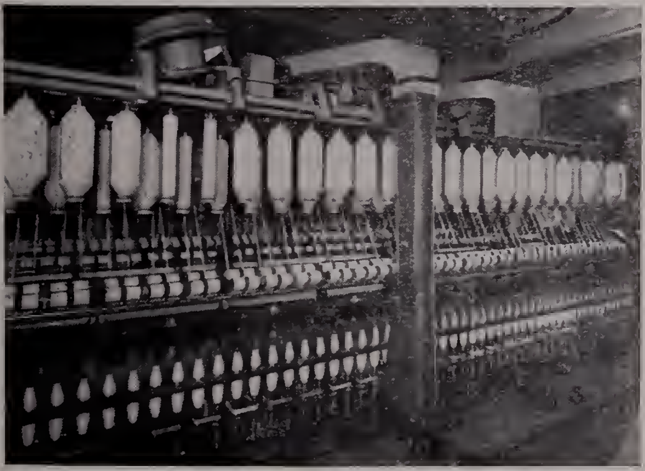

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CORRECTION

COVER EXPLANATION OF WINTER 1956 ISSUE: The cover for the Winter 1956 Issue of the BOBBIN & BEAKER was an enlarged reproduction of a photomicrograph which was made by Dr. A. N. J. Heyn, Professor, School of Textiles, Clemson Agricultural College. This photomicrograph was of a cross section of Orlon fibers and was originally published in Dr. Heyn's book, "Fiber Microscopy", Interscience Publishers, New York, N. Y., 1954, plate VI B. THE BOBBIN & BEAKER is greatly indebted to Dr. Heyn for his kindness in having lent the photomicrograph to our publication for use on the cover. Also, THE BOBBIN & BEAKER regrets its error in having given credit to someone else.

The Cover: Cross sections of viscose rayon as seen under the interference microscope. The core, skin and cuticle are revealed in brilliant color contrast.

Photomicrograph by Dr. A. N. J. Heyn, Professor, Natural and Synthetic Fibers. For further details, see the article on the interference microscope on page 11.

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Graduate Research in Textile Chemistry at Clemson College

by

J. H. Langston, Professor
Textile Chemistry, Department

One of the most important aspects of any graduate program is the research which the degree candidate does to assemble material for the writing of his thesis. In the sciences a thesis is required to represent an original piece of work — original in concept, attack, or in angle of approach, but, in any case, something that has not been done (at least in the same way) before. The thesis itself may be quite short, but the information contained therein may be extremely valuable. It certainly represents a considerable amount of work and the acquisition of a type of experience which can be obtained in no other way. This experience is the fundamental basis for the thesis requirement in the graduate curricula.

The Department of Textile Chemistry at Clemson is unusual, if not unique, in having an undergraduate thesis requirement. Obviously, the investigation of a problem cannot be very extensive in the time available in the student schedule for this work, but it serves to familiarize the student who goes from undergraduate school directly into industry with the fundamentals of research procedure. It also acts as an introduction to research for those of our B.S. graduates who stay on or who later return for graduate work in the department. In no sense, however, does this undergraduate thesis compare in complexity, time, or degree of originality required with the graduate thesis.

Since the only graduate degree offered in the Clemson Textile School is the M.S. in textile chemistry, some information as to the development and scope of the graduate research program might be of general interest.

Textile chemistry is a broad field, having close ties with all branches of chemistry and physics, from which basic sciences it has developed into a separate study. Many applications to which textile chemistry is put are of a practical nature, of course, but every practical usage has a broad theoretical background. There are, therefore, two types of research problems or two types of approach—theoretical and practical. Insofar as it is practicable, our research program is keyed to both, although an attempt is made to avoid such problems as might be attacked by other departments in the college.

Problems are selected on the basis of interest, importance, general applicability, timeliness, etc. Subjects for research are suggested by industry, by the teaching staff and by the students. Students are encouraged to work on topics in line with their particular interests and experience (if any). Holders of industrial fellowships may be influenced to a greater or lesser degree in the choice of a research problem by the wishes of the sponsoring companies. This diversity of sources for research ideas is highly advantageous in furnishing breadth of coverage in the field; and industry is especially encouraged to offer suggestions as to topics reflecting its needs and interests.

An attempt is made to maintain a variety of project types in order to provide as wide coverage of the field as possible. This is sometimes difficult with a small staff and a small student group; and it obviously means spreading the research effort rather thin. An integrated program, where a number of students work on different aspects of the same problem, might produce more dramatic publication possibilities, and such a philosophy of research is frequently encountered in larger institutions. From the standpoint of results accomplished there is much to recommend it; and where there is a staff and student group large enough to provide coverage of the field by this method, it is logical. Even then, however it has one drawback—a tendency to define the research area of the student so rigidly that he may miss the advantages of being able to choose his direction of attack as circumstances and developments may warrant, thus limiting his freedom of action and initiative. It is for these reasons that the program in this department is directed toward the student and the benefit that he may derive from his research efforts rather than toward the end of glorification through publications or publicity.

The breadth of activity in the field of textile chemical research at Clemson is revealed by a study of subjects undertaken during the several years in which the graduate program has been in effect. For this purpose, list of thesis titles with the authors and dates is given below along with a brief elaboration on the subject matter covered:

"Effect of Urea - Formaldehyde on the Tensile Strength of Cotton", John W. Hawkins, 1951 — A study of the relative effects of various factors in tendering cotton during urea-formaldehyde finishing treatments, resulting in suggestions as to ways of minimizing the overall effect.

"The Preparation of Polyhydric Alhyds and Their Application to Nylon and Orlon Fabrics", Richard F. Jenkins, 1951—An attempt to improve or simplify the practical methods of dyeing these fibers through the use of a combined dyeing-finishing bath, which would result in the formation of a durable polyhydroxy-substituted polyester on the fiber surface and which would, in turn, be reactive to substantive dyes.

"Antistatic Agents on Orlon and Dacron", Samuel W. Boddie, 1953 — An evaluation of various types of chemical agents as anti-stats for use on these highly static-producing fibers, using a specially built static-measuring instrument.

"Incorporation of Bonding Agents in the Dyeing of Fast Colors on Cotton", Peter A. Cook, 1954—Determination of the effect of various types of commerical latices on the fastness, stability, crock-resistance, tensile strength, abrasive resistance and color value of vat and nepthol dyes applied to cotton under a variety of conditions.

"The Study of Mercerization with Mechanical Pressure Applied", William L. Mathias, 1954—Investigation of the effect of mechanical pressure on increasing the strength of various cottons mercerized under a variety of conditions.

"Application of Ultrasonics to the Dyeing and Finishing of Textiles", William T. Roff, Jr., 1955 —The effect of ultrasonic energy on the application of various agents—particularly pigments and resin finishes—to fibers, illustrated with interesting photomicrographs showing dispersion and distribution effects.

"Studies of the Effects of Certain Emulsified Vinyl Polymers as Textile Finishing Agents", Hugh K. Eason, 1956 — Preparation of a number of new vinyl-type latices and a study of their effects as finishing agents on various fabrics. A correlation is made between finishing effect and the presence of certain chemical groupings.

At the present time seven projects are underway in the graduate research program involving the following subjects:

1. A study of the fundamental and practical effects of a new silicone compound on cotton and wool.

2. Development of a method for improving the strength, anti-shrinkage, and dyeing properties of wool by a new type of molecular cross-linking.

3. Preparation and evaluation of a new series of modified starches for use as permanent finishes for textile applications.

4. Development of new properties in starch and cellulose through the application of a unique epoxide-type secretion.

5. Study of a unique example of the effect of light on a resin-pigment treated fabric.

6. A study of the reaction of cellulose with various vinyl compound, aimed at the development of a modified cellulose which will have variously improved properties.

7. A study of various hydrophilic finishes for hydropholic fibers to improve the comfort factor in clothing made from synthetic fibers.

The fact that the present number of project underway equals the combined number of those of previous years may be taken as an indication of the growing interest in graduate work in textile chemistry. As the field becomes progressively more complex with the development of new fibers, new dyeing and finishing techniques — all resulting from continuing research—the importance of research training in the education department assumes greater magnitude. It is the hope of the textile chemistry department at Clemson to extend its activities in the field through further growth in the number of graduate students and the broadening of its research program with the acquisition of new instruments and facilities.

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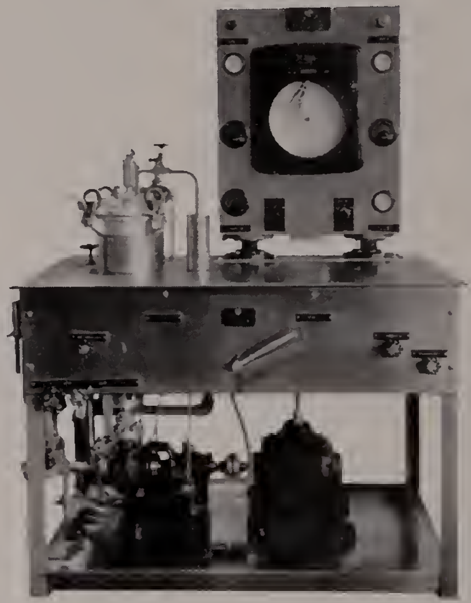

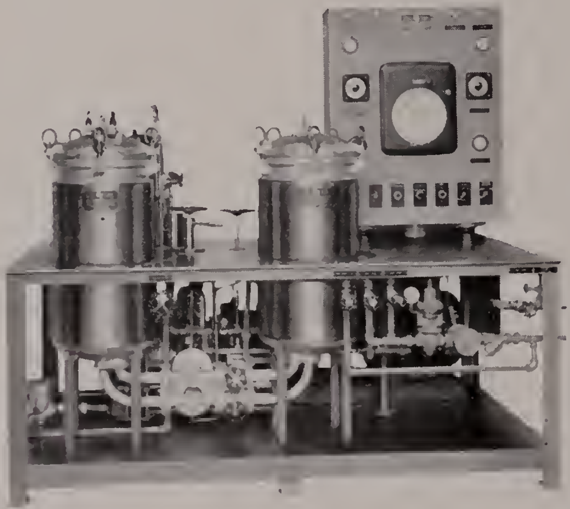

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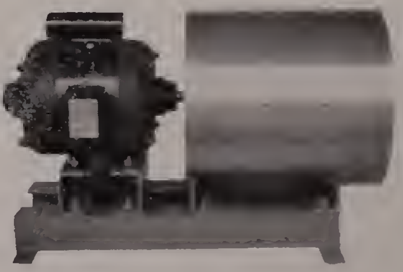

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Clemson School of Textiles Host to American Textile Machinery Association

Hugh M. Brown, Dean
School of Textiles

On February 12, Clemson College and The School of Textiles were host to the American Textile Machinery Association. More than fifty representatives from various member companies attended.

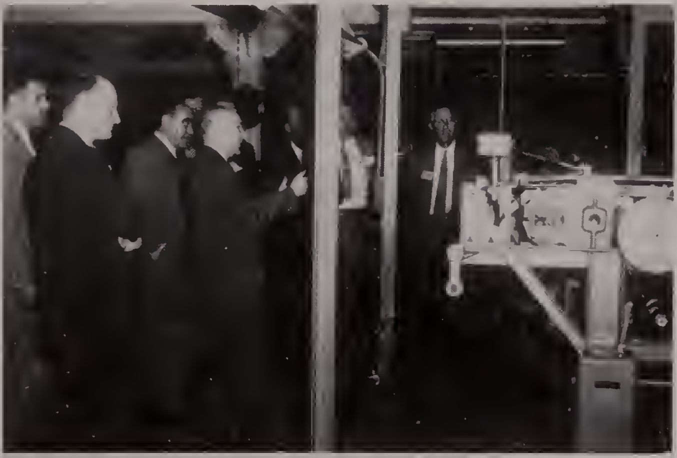
To entertain our guests there were forty representatives from the College, the Clemson College Board of Trustees and the J. E. Sirrine Textile Foundation. The program opened with a welcome by Dr. R. F. Poole and the College deans and the Textile School department heads giving short discussions of the aims and purposes of their organizations. This was followed by a discussion of the research program of the Textile School by Dr. Hugh M. Brown.

Four groups were formed for tours of the Textile School, Engineering School shops, the U.S.D.A. Southeastern Ginning Research Laboratory, U.S.D.A. Spinning Laboratory and Laboratories of A.C.M.I. This gave the machinery representatives an excellent opportunity to see our College first hand and to study our Textile School and its machinery needs. The purpose of the gathering was to further the fine spirit of co-operation between the Textile School and the machinery industry. The machinery companies have always helped the School obtain the finest machinery, sending their engineers here to work out special units for teaching purposes, and granting the School good discounts and in some cases machinery on a consignment basis.

There was opportunity throughout the day for the machinery people to meet and visit with the textile faculty and with members from the Sirrine Foundation, Board of Trustees and other College personnel.

A buffet luncheon was served followed by an illustrated address by Mr. C. S. Reed, Vice President of Duke Power Company. He gave an excellent picture of the tremendous manufacturing potential of the Piedmont area.

The gathering was addressed at a banquet in the Clemson House by Mr. James H. Hunter, President of the American Textile Machinery Association; and Mr. F. E. Grier of Greenwood, President of the American Cotton Manufacturers Institute and President of Abney Mills.



Mr. Hunter, who was introduced by Dean Hugh M. Brown of the Clemson Textile School, expressed appreciation at the opportunity to observe first hand the work Clemson College is doing in the field of textiles.

Mr. Hunter said that America's superiority in textiles could not be maintained "without the management and personnel which Clemson and other textile schools are furnishing the industry."

In speaking of progress made in the textile field, Mr. Hunter said the attitude of textile machinery critics is "unfounded and erroneous", and has been "detrimental to the machinery industry." "Textile machinery" he said, "has more than kept pace with demands of the industry."

Mr. Grier's subject was "Textiles Today and Tomorrow." He said the textile industry is on the bottom and can go only up or out. He expressed confidence that recent progress in the industry and federal import regulations will aid the industry in going up.

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THE INTERFERENCE MICROSCOPE AND OTHER NEW MICROSCOPY EQUIPMENT AND THEIR USE IN FIBER RESEARCH AT CLEMSON

by Dr. A. N. J. Heyn, Professor
Natural & Synthetic Fibers, School of Textiles

The School of Textiles has some time ago acquired modern microscopic equipment for fiber research. The latest model research microscope is equipped with high powered lenses, accessories for polarized light, phase contrast and vertical illumination. It has built-in illumination and a modern focusing system by moving of the stage. A large photomicrographic camera is permanently attached to the trinocular body which makes it possible to switch directly over from visual observation to photomicrographic recording.

The equipment is being used for the study of fibers and textile problems in continuation of previous work on fiber and textile microscopy.(1) The polarized light and phase equipment will e.g. be used for the study of the **sub-microscopic structure of fibers,** by refractive index and birefringence. The equipment will also be used in the research project on **damage of cotton**(2), and extensive **bacteriological studies on raw cotton** are being carried out with it at present(1).

The most interesting new piece of equipment is an **A. O. Baker interference microscope.** This is a new type of microscope which has recently become available on the market. So far, only biological work has been carried out with this microscope; it has not yet been applied until now for fiber research; Intensive research has been carried out with it during the year in the Textile School. A short description of this new type microscope follows here.

The principle of the interference microscope is similar to that of the polarizing and phase microscope, in so far that in all three types of microscopes interference of light is used for obtaining information beyond that given in ordinary microscopy.

In **polarizing microscopy,** interference occurs between light which passes through the fiber, vibrating two perpendicular directions; in this way information can be obtained on the birefringence of the fiber.

In **phase microscopy,** interference occurs between the direct and diffracted beams, passing through the fiber. A phase difference is deliberately introduced between these two beams. In this way, local differences in refractive indexes are converted into differences in **contrast** in the image.

In **Interference microscopy,** interference occurs between light passing through the fiber and light passing through the medium. If the optical path through the specimen differes from that through the medium, the two beams will have different phase, so that interference will occur when they are combined in the image. In this way, information can be obtained, e.g., about refractive index, and structures of different refractive indices can be distinguished since they obtain different interference colors.

Diagram figure 1 shows how the A. O. Baker interference microscope works. A beam of plane polarized light enters the condenser and is divided by a double focus calcite lens or plate in the upper part of the condenser, into two beams (ordinary and extra ordinary beams) which are plane polarized at right angles to each other. The condenser brings one beam at a focus in the object plane; this beam transverses the specimen detail. The other beam is focused at the side of the object (in the shearing system), or underneath the object (in the double focus system) and passes through the medium at the side of the specimen or spreads all around it. If the optical path through the specimen detail differs from that through the medium, the two beams will have different phase. The separate beams are recombined by a similar calcite plate in the objective so that they follow the same path and can interfere.

This difference in phase can be measured with the customary methods used in polarizing microscopy. From this difference, the refractive index of the specimen detail can be calculated.

Under the proper conditions, areas of different refractive index and/or thickness will obtain different colors when white light is used. This makes a clear distinction of details possible, as if the preparation were stained in various colors.

Very important results were obtained with this microscope from the very first beginning of its application to fiber research in Clemson. If a fiber, for instance, a nylon filament, mounted in water, is placed under this microscope, the path difference through the medium and the different thicknesses of the fiber will result in a series of interference fringes in longitudinal direction (figure 3). If polychromatic light is used, the fringes are multi-colored. From the number of the fringes and the diameter of the fiber, its refractive index can be calculated. A dacron fiber of the same diameter will show many more fringes because its refractive index is higher.

It was found that cross sections of rayons show the various layers of skin and core, which are so important for the fiber properties, in the most brilliant color contrast (figure 2). The laboratories of rayon industries have long tried to differentiate these layers by complicated staining techniques, which are at least indirect and cumbersome. This new method, with the Baker interference microscope, shows these details of different refractive index, not only instantaneously without any further technique, but makes it also possible to quantitatively determine the refractive index of each component layer. The primary wall in cotton is easily recognized in the same way. Fine skin layers were recognized in several synthetic fibers. A nextensive report and the results with all different fibers is being published.(⁴)

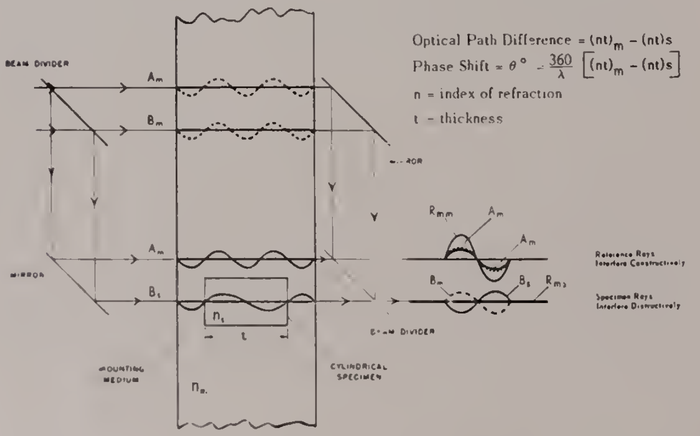
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FIGURE 1. **Principle of the interference of light in interferometer and in the A. O. Baker interference microscope.**

A beam of light is separated by a beam divider and the separated beams pass through different parts of object space.

Rays passing through equal optical path, A_m and A_m interfere to give rise to constructive interference. Rays passing through different optical path, B_m and B_s may rise to destructive interference. When the reference ray, B_m interferes with a ray through specimen detail B_s, destructive interference will result since the specimen in the illustration has introduced a phase difference half a wave length in advance of the reference ray.

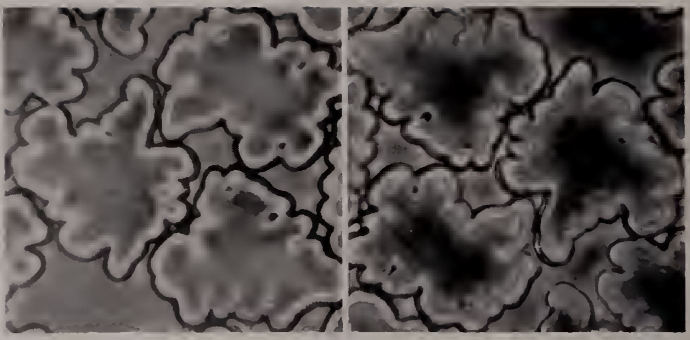

FIGURE 2. **Skin and Core Structure of Viscose Rayons Made Visible Under the Baker Interference Microscope.**

Cross section of viscose rayon under Baker microscope 1250 X. Under the proper physical conditions, the areas of different black-white shades show actually the most briliant different colors, which can even be changed at will by the setting of the microscope.

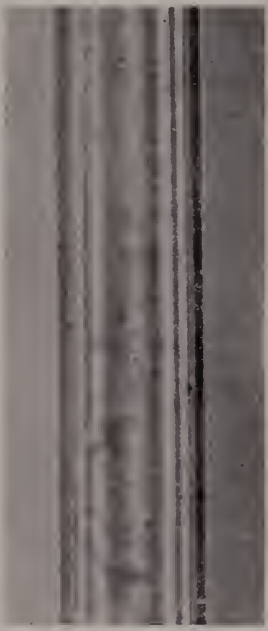

FIGURE 3. **Nylon fiber under interference microscope.**

The fiber is mounted in water. Note interference fringes parallel to long axis of fiber.

* Footnotes:

¹)A. N. J. Heyn, Observations of the Birefringence and Refractive Index of Synthetic Fibers with Special Reference to Tehir Identification. Text. Res. J1., 22, 513-522. (1952); The Identification of Synthetic Fibers by Their Refractice Index. Text. Rest. J1., 23, 2146-251. (1953); **"Fiber Microscopy"**, a Textbook and Manual. Interscience Publishes, New York, 400 pages. (1954).

²) A. N. J. Heyn, Causes and Detection of Damage in Raw Cotton, Bobbin and Beaker, Fall Issue 1955, Spring and Summer Issue, 1956, Textile Industries, Vol. 120, No. 5, pp. 137-145 (May 1956).

³) A. N. J. Heyn, Bacteriological Studies on Cotton. (To appear)

⁴) A. N. J. Heyn, The Use of the Baker Interference Microscope in Fiber Research. I. Basic Studies with Rayons, Cotton, Wool and Synthetic Fibers. (To appear).

A Brief History of Burlington Industries

John Harden, Vice President
Burlington Industries, Inc., Greensboro, North Carolina

The history of Burlington Industries is an important chapter in the textile industry and a fascinating story of planning, building, producing and merchandising new products which have added to the comfort and well-being of the American public.

In 1923 some local businessmen in Burlington, North Carolina, joined Spencer Love, a young World War I veteran, in building a small cotton textile mill employing about 200 persons. As a tribute to the community in which it was founded, the Company was named "Burlington Mills." The first plant manager was Mr. Love, who continues as chief executive of the organization in which capacity he has served for the past 34 years.

Seeing the possibilities of rayon in 1925, the management of this new enterprise began a program of expansion in order to develop fabrics from this revolutionary manufactured fiber. Working with rayon first as a decorative yarn, these textile pioneers were fascinated with this material and saw in it the answer to the age-old search for inexpensive high-quality fabrics.

The first plant to produce rayon dress goods was constructed in 1927. As the producers of rayon yarn improved their product, early problems of stiffness, shiny finish and mottled dyeing were solved. Soft, pliant, dull-finish fabrics easy to drape and tailor were developed. Rayon soon emerged from the category of a cheap bargain basement substitute for silk into a beautiful fabric in its own right and at prices attractive to the general public.

Production was expanded into the drapery and upholstery field, rayon dress crepes, acetate taffetas, novelty dress fabrics, and rayon sheers. The depression years of the early thirties failed to halt the Company's steady growth. Closed cotton mills were purchased and modernized for rayon and new plants were built, greatly increasing production and providing employment for many idle textile workers.

With its success in industrial growth, Burlington also established a new pattern of industrial progress by decentralization of its plants in smaller cities where both plants and employees could fully enjoy the benfits of small town and rural surroundings. Local citizens frequently joined with the Company to help finance the building or purchasing of a plant in order to start a new venture which would add its productive strength to the community.

With the physical growth of the plants went an employee relations program which never lost sight of the Company's human resources and which has maintained for it a position of leadership in constructive wage and employee benefit policies.

Manufacturing operations were gradually integrated and plants for auxiliary processing equipment were activated. A New York Company was formed to handle the merchandising of fabrics. By the close of 1936 a total of 22 plants in nine communities were producing $25,000,000 worth of goods annually. In early 1937 Burlington Mills Corporation was organized to consolidate the various previously associated companies and the stock of the new company was listed on the New York Stock Exchange.

Continuing its policy of diversification by applying man-made yarns to new uses, Burlington entered the hosiery field in 1938. With the development of better staple rayon, several spinning plants were acquired in 1940 to establish a spun rayon division. This made possible the production of a wider variety of dress and suiting materials. Two cotton spinning mills were added to meet the Company's need for cotton yarns. By 1941 there were 38 plants in three states with annual sales of $62,957,000.

Burlington at war produced more than 50 different products for Uncle Sam, including fabrics for parachutes, uniforms, tents, raincoats, airplanes, gun covers and tow targets. Mr. Love, chairman of the board, was called to Washington to head the Textile, Clothing and Leather Division of the War Production Board. A total of 4,009 employees entered the armed service, and 109 gave their lives for their country.

In 1944 foreign operations were begun, leading to investment abroad so that now Burlington has an interest in plants in Canada, Colombia, Venezuela and Mexico. The Company entered the narrow fabrics field the following year by acquiring several ribbon plants. Today it is one of the country's largest producers of ribbon.

In 1946, annual sales reached $141,544,000. This same year the Cramerton Division — producers of fine, high-style cottons — was added to the Company. This insured greater diversification in the production of all cotton and rayon blended fabrics for many end-use trades. Growth continued in 1948 with the expansion of hosiery operations through the acquisition of the May-McEwen-Kaiser Company plants and organization.

In 1950 a multi-million dollar plant improvement and machinery betterment program was begun which embraced additions and improvements to nearly all existing plants and their equipment. This same year the Company acquired a majority interest in Brighton Mills located at Shannon, Georgia, an old established spinning and weaving operation. A substantial modernization program was instituted here.

Further diversifying it range of products, Burlington in 1952 acquired the Peerless Woolen Mills of Rossville, Ga., National Mallinson Corp., Sarfert Hosiery Co., and Southern Silk Mills plant.

The acquisition of Peerless further broadened its base in the general textile field by placing the Company in the wool field for the first time. One of the oldest and largest single-unit woolen mill operations in the U. S., Peerless is a completely integrated organization from the purchase of raw wool to the delivery of finished goods. It operates in the automotive, blanket and apparel fields. Acquisition of Peerless was a logical step in keeping with Burlington's development of many new wool-like fibers which will be used in blends with wool in developing a well-rounded program of handling the newer man-made fibers.

In 1954, Burlington acquired controlling interest in Pacific Mills, maker of fine woolen and worsted suiting fabrics, and in the Goodall-Sanford Co., maker of fabrics for the famed Palm Beach suits and other diversified products.

During 1955, the Mooresville Mills cotton operations were acquired and an extensive program of plant improvement and machinery betterment was begun there. In September 1955, Burlington acquired controlling interest in Ely & Walker, one of the nation's leading manufacturers, converters and distributors of cotton products. The successful and experienced Ely & Walker management team under leadership of President M. Weldon Rogers continued with Burlington intact. During 1956 the company further diversified its operations through acquisition of Hess, Goldsmith & Co., a leading producer of fabrics from glass fibers; Raeford Worsted Corporation, with modern plants at Raeford, N. C., and Clarksville, Va.; and Klopman Mills, a leading greige goods sales and manufacturing organization.

To more accurately reflect the increased diversification of manufacturing operations and products, stockholders in early 1955 had voted to change the name of the Company to Burlington Industries. Under this new corporate organization, Burlington Industries now serves as the parent company for 15 member companies: Burlington Mills, Pacific Mills, Burlington Hosiery Co., Peerless Woolen Mills, Burlington Decorative Fabrics Associates, Galey & Lord, Goodall-Sanford, Burlington Narrow Fabrics, Bur-

J. Spencer, Love, President
Burlington Industries

lington Export Co., Mooresville Mills, Burlington International, Ely & Walker, Raeford Worsted Corporation, Hess, Goldsmith & Co., and Klopman Mills.

Since its modest beginning in Alamance County, North Carolina, Burlington Industries has become the world's leading producer of textiles. Including foreign plants, it now has 100 modern plants in 74 communities in 13 states and four foreign countries, employs 49,000 people, and has an annual sales volume of over $600,000,000.

As contrasted with its early production, Burlington Industries now produces a great variety of quality products serving virtually every trade that uses textiles. Among those products are fabrics for women's dresses, suits, coats, sportswear, blouses and lingerie; for full-fashioned and seamless hosiery, half-hose for men, socks for children; fabrics for men's suitings and shirtings; men's and women's woolen outer-wear fabrics; blankets; retail and accessory fabrics; industrial, automotive and aviation fabrics; curtain and drapery materials; narrow fabrics and ribbon, and many others.

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DYEING AND FINISHING COTTON
AND SYNTHETIC PIECE GOODS

Southeastern Cotton Ginning Research Laboratory

by
Wayne Freed, T.E., '59
Assistant Managing Editor

The United States Department of Agriculture, which is primarily a research organization, has been interested in solving the numerous and far-reaching problems in the textile industry which have come about in the last two or three decades. Several phases of the cotton industry which have been studied are production, marketing, utilization, and the manufacture of the finished product.

Ginning, which is the last step in the production phase, has undergone more changes in requirements since 1930 than had occurred in the preceding 100 years. The United States Department of Agriculture has set up, and maintains, three cotton ginning laboratories that solve the problems brought about by these changes. The laboratories are a part of the Agricultural Engineering Research Branch of the Agricultural Research Service.

The United States Cotton Ginning Research Laboratory at Clemson, South Carolina, was established in 1955 to serve the Southeastern states. This laboratory was "established to provide data for promoting better ginning equipment and techniques in the Southeastern states."

The Clemson laboratory works in conjunction with two other ginning research laboratories. These other laboratories are located at Stoneville, Mississippi, for research in the Midsouth and at Mesilla Park, New Mexico, which serves the West and Southwest. These laboratories work primarily for the farmer's benefit and to benefit the farmer they must consider all the essential steps until the ginning is completed.

The steps of ginning which are under research include conditioning, cleaning, extracting, ginning (separation of lint and seed), condensing, lint cleaning, packaging and baling, collection and disposal of lint and seed, and just recently, storage and handling.

Ginning has two primary functions: (1) Converting the farmer's harvested material into salable lint and seed, (2) Returning to the farmer the best combination of lint and seed so that he might get the best profit from their sale. The research carried on by the various ginning laboratories has greatly facilitated the accomplishment of these functions.

The ginner can only preserve the inherent qualities of the cotton; he does not improve them. Proper ginning equipment and methods can preserve the good qualities in cotton brought to the ginning plant. The research laboratories have to consider such things as ginning processes, storage, conditions while ginning, and even such things as the type seed and the weather in deciding on the proper equipment and methods for their respective areas.

The laboratories perform research on farm to gin hauling and storage, drying and cleaning at the gin, separation of seed from lint and packaging. They also study the effects on fiber quality at various conditions under which it is ginned. This research has allowed a higher quality fiber to be sold and better seed for planting and commercial use.

Research Program

The planned research program of each laboratory is run in conjunction with the other research centers. At times their problems are alike, but generally they differ according to the geopraphical area of the center. For instance, the problems of extreme moisture and extreme insect infestation, which are present here in the Southeast, would hardly present the same problems for the laboratory which is located in the West.

The research program usually follows a procedure somewhat like the following: (1) The problem is stated and the program outlined, (2) Tests are set up by specific design, (3) Results are gotten by statistical design. Field experiments are conducted rather than quality controlled experiments as they are not as deeply involved.

The cotton which is used is from selected sections. The tests are run under controlled conditions to the extent that as many variables as possible are eliminated.

After the results are checked and tabulated, they are published in newspapers and research papers for the benefit of all. New inventions are also publicized for the benefit of the cotton industry.

The facilities of the United States Cotton Ginning Laboratory at Clemson include $100,000 worth of gin machinery and a staff of three engineers, a mechanic, a secretary, a mechanics helper, and a student trainee (ag engineer). The staff and machinery are coordinated to find the very best methods of cotton ginning for this area.

The facilities also include a gin sample clinic which determines the trash content of the lint and seed, the moisture content of the elements, and the fiber characteristics if the need arises.

Current projects of the Clemson research laboratory include:

(1) Adapting and testing gin machinery and techniques in different locations in the cotton belt.

(2) Determination of ginning characteristics as effected by new and improved varieties of cotton and new cultural practices.

(3) Measuring fiber properties of cotton as effected by gin processing.

(4) Determination of optimum moisture content of cotton for gin operation.

(5) Storage and handling of seed cotton.

In order to carry out a satisfactory program which is beneficial to all, the government experimental laboratories cooperate with agricultural experimental stations in the various states, ginners' organizations, trade organizations, and individuals.

The high standards of price, quality and promotion, which are primary concerns of the research laboratories, have come about by the vast research of these centers and by cooperation with other experimental agencies. It is the determination of these government research laboratories to continue to raise standards so that they might help the farmer, and ultimately benefit others along the way.

NOTICE!

SCHOLARSHIP INFORMATION

For the first time the School of Textiles has available some financial aid for entering freshmen. The Leon Lowenstein Foundation is the first organization to make available aid to freshmen through the School, though the industry has been most generous in aiding students at the junior and senior level.

Two awards of $2000 are available annually for male freshmen who enroll in the School of Textiles, to be paid equally during four years of satisfactory undergraduate study. These awards will be based on high school records, entrance examination scores, need and the judgment of the committee as to the character and possibility of future success, by the applicant. Selection will be limited to applicants whose families have an income of $10,000 or less.

Prospective students and applicants may secure further information and application forms from the Director of Student Aid. Application should be received by May 1, and the College Entrance Examination taken by May 15 to be considered for the coming school year.

It is hoped that the readers of this magazine will urge any worthy candidates to apply.

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Organization Planning:
A KEYSTONE TO GOOD MANAGEMENT

By J. B. Joynt, President
Society for the Advancement of Management

There are two popular misconceptions about organization planning — one is, that it deals only with designing the structure; the other, that it only deals with selection of personnel.

A broader concept is that both structure and people are important. Organization is first a planning process by which we fix responsibility for results, delegate authority to make decisions, and establish effective working relationships between functional groups and individuals. To improve manageability of the enterprise is its primary objective. This is accomplished by integrating the skills, interests, and objective of pople with the objectives of the enterprise.

Some basic considerations in organizations planning are:

1. Organization Objectives
   - a. The basic plans and objectives of the corporate enterprise should be determined, and the organization structure should be adapted to carry out such plans and objectives effectively.
   - b. The organization should be built around the major functions of the business. It should contribute to and also be governed by the basic work processes.
   - c. The organization should be sufficiently flexible to meet new and changing conditions which may be brought from within or outside the company.
   - d. The organization structure should be as simple as possible and the number of organization units be kept at a minimum.
   - e. The number of levels of authority should be kept at a minimum. Each additional management level lengthens the chain of authority and responsibility and increases the time for instructions to be distributed to operating levels and for decisions to be obtained.
   - f. The form of organization should permit each executive and supervisor to exercise maximum initiative within the limits of delegated authority.

Until we determine our objectives, there is no reason to organize or to reorganize. We do not change organizational structure just to have a better looking chart. We must determine not only the objective but the real gains anticipated under the new plan.

Sometimes we take our objectives for granted. They're traditional and accepted without question. For that reason, apart from organization, it is quite essential to review objectives. This review should apply to the company and each organizational unit within it. Such a review should be a continuing program. Many companies unfortunately do this only when a new president comes in, earnings begin to drop, or when they slip competitively. Too few regard this introspective review as a recurring part of the management job.

A director of industrial relations in a small textile plant had 12 people reporting to him. Eight were keeping records and only four doing industrial relations work. The department had added certain functions during World War II while operating on a cost-plus basis. Five years later they reviewed their objectives. Many of these functions were contributing little. Other very important things never had been considered. As a result of the review, nearly all record-keeping was eliminated, and some new programs were undertaken. This department now has but seven people; however, the foremen and department heads currently are getting real industrial relations benefits.

2. Assignment of Responsibilities — Delegation

   Objectives are accomplished through people by the assignment of responsibility and authority necessary to insure that a good job can be done. One common misconception arises from re-delegation. Accountability is not removed by delegating to a subordinate. Suppose a vice president delegates to a department head, who in turn, dele- to his subordinates. Ultimate responsibility still rests with the vice president. The following are guiding principles in assigning responsibilities:
   - a. Assign responsibilities on a broad a basis as possible. One of the major causes of executive discontent is lack of challenging assignments and failure to give an individual freedom to

manage. People are looking for an opportunity to contribute.

b. Group like functions together, and keep the organization as simple as possible.
Delegation begins with an attitude of mind, and we should place the decision making as close as possible to the point of action.

3. Establishment of Proper Relationships
When determining authorities and responsibilities of organizational units, we also must consider relationships between them. Establishing of proper relationships is tied into the assignment of functions. As a general rule, line and staff relationships are most important. We should:

a. Determine what the line functions are. This applies not only to the company but to principle organizational units within.

b. Determine what staff services are necessary to support the line.

c. Establish relationships between line and staff. How will they work with each other?

d. Establish proper cross-relationships between both staff and line units to make our day-today working relationships as simple and direct as possible. We want to eliminate "fuzzy", ill-defined relationships. Until we do this, we will not have a clean organizational structure.

e. We also must consider outside relationships, liaison with legal counsel, the press, banks, customers, the community, the suppliers, etc. Many difficulties arise in selecting a man to contact customers—not on direct selling—but on many things related to selling. The same applies to suppliers. We can eliminate these difficulties only when we determine the contract in each major functional area.

In summing up, organizational planning is the process of assigning responsibilities to organizational units and individuals and establishing proper relationships which will facilitate the accomplishment of objectives. When this is done, people know where they stand. Doubts, fears, and suspicions are erased, leaving the path to progress and growth less obstructed.

If we have done a good job of organization planning, we will have assigned authority and responsibility on as broad a basis as possible to every employee, and create a climate in which each individual will be able to make his maximum contribution to the success of the enterprise.

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*Patent Nos. 2,610,363;
2,490,544; 2,412,357.
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INDUSTRIAL ENGINEERING IN THE TEXTILE INDUSTRY

By C. E. Anderson
First Editor of the Bobbin & Beaker

During the past two decades there has been developed a new science in industry which has been appropriately named Industrial Engineering. The Textile Industry has been one of the last major industries to incorporate these principles in manufacturing. In my opinion this is primarily due to the fact that initially industrial engineering principles more readily lent themselves to the highly repetive bench jobs such as found in machine shops and assembly lines. As a matter of fact, practically all texts on the subject use the heavy industries as a basis for study. This is not intended to convey the idea that industrial engineering has no place in the textile industry because as we all know within the past fifteen years the experience has been to the contrary. Practically all textile plants today use some form of industrial engineering controls to aid in manufacturing.

It is not the intent of this article to discuss the details of setting up industrial engineering practices in a textile plant. But rather to discuss the overall benefits derived from the use of these principles. At this point it is well to define industrial engineering. In the broad sense it is the study of man and machine to develop the best methods of operation of both to achieve the greatest return on investment. Some may argue that the lowest over-all cost is the goal, and in many instances the greatest return on investment may be achieved by the lowest cost; however, this is not necessarily true.

From management's point of view, industrial engineering provides the tool for more accurate controls of costs and production. Reports can be more reliable and a measurement of all costs can be compared with an engineered standard. Decisions for the purchase of new equipment or the modification of existing equipment can be made with confidence. In the past, many plants have justified new machinery on the basis of labor savings much of which could have been made on existing equipment if the work assignments had been measured. With todays's high cost of new machinery it is not only desirable but imperative that complete studies be made to show justification of the purchase.

It has occurred to me that textile machinery manufacturers would be wise to have an industrial engineer on their staff for the sole purpose of determining if newly designed equipment would show a satisfactory return to the purchaser. This is a field in which only the surface has been scratched. Such a service would be invaluable to the purchaser and particularily to the smaller plant which may not have a full time industrial engineering staff. In the past, too much textile machinery has been designed to improve only one or two phases of the operation whereby, with a slight modification, other phases could have been improved. In other words, new machinery must have as a goal the same goal as Industrial Engineering, greater return on investment.

How about line supervision; what are their reactions to engineered standards and measured work assignments? For the most part, line supervision is skeptical of measured work assignments. This is normal because all of us are skeptical of things we do not understand. For this reason it is most important that all levels of supervision be given at least a 10-12 hour familiarization course in Industrial Engineering. This will greatly aid the standards man who will be working with supervision in the plant. The line supervisor will not be completely sold, however, until a measured work assignment has been installed in his department and working satisfactorily.

The line supervisor must learn to look upon the Industrial Engineering Department as an additional tool to aid him in doing a better manufacturing job. In no instances should any of the responsibility be taken from the Department Head. In fact the ideal situation arises when the supervisor enlists the help of the Industrial Engineer to help solve his problems. Industrial Engineering must be used as a crutch for weak supervision. In the final analysis the line supervisor must think of the program as his program and can never either actively or passively give the impression that he is not in agreement with the program 100%.

We have discussed both higher management and line supervision's reaction and benefits from an Industrial Engineering Program. Obviously, we must look at the employee's reactions because he is the one directly affected. We all know it is most difficult to change man's habits of work that have been deeply imbedded over long periods of time. This can be done very successfully, however, and as far as I am concerned the key is being completely honest. Many times we have greatly under-estimated the intelligence of our employees. Therefore, we have only told them part of the story and bred distrust because the balance will be learned from wrong sources or fabricated in their minds. I cannot over-emphasize the point that the employee must be told every detail that will affect his work assignment.

After an employee is thoroughly familiar with engineered work assignments he will realize the benefits of such a program. He will come to appreciate the fact that his assignment is measured with the same yardstick as every other employee in the plant. Also, where incentive pay is applicable, he will appreciate the sound basis upon which the incentive was derived, and that he is being paid on the basis of effort and skill he expends. The very fact that assignments are derived from engineering principles and not from opinions is a wonderful plus factor for selling the employee.

We must never forget that after the assignment is installed on a sound basis, we cannot expect any further effort on the part of the operator. In other words, he has a standard work assignment at normal pace and to increase his output per hour we must eliminate some of his present duties either by method changes, running qualities of the product, new machinery, or a combination of all three. Herein lies

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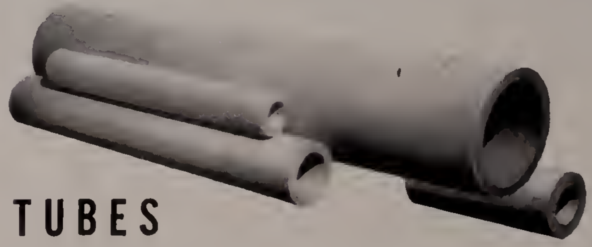

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the value of Industrial Engineering in justifying new machinery or modification of existing machines.

The Industrial Engineering Department is an excellent training ground for future supervisors. It provides a pool of men who have been exposed to most phases of the over-all operation, with an additional appreciation of industrial engineering principles. College trainees find this line of progression extremely beneficial in that they can work on assigned projects which give them excellent training plus giving management a better chance to evaluate their progress. In addition there are many who want to follow industrial engineering as a lifetime vocation in which there are ever growing opportunities.

I realize the many other phases of Industrial Engineering that have not been discussed in this article; however, it would require volumes to cover each phase in detail. I have only covered those points I consider extremely important and after all, they are mainly just good common sense.

We must, hawever, remember that although Industrial Engineering is a wonderful new tool to improve manufacturing costs and quality, it does not replace good supervision for which no substitute has ever been found.

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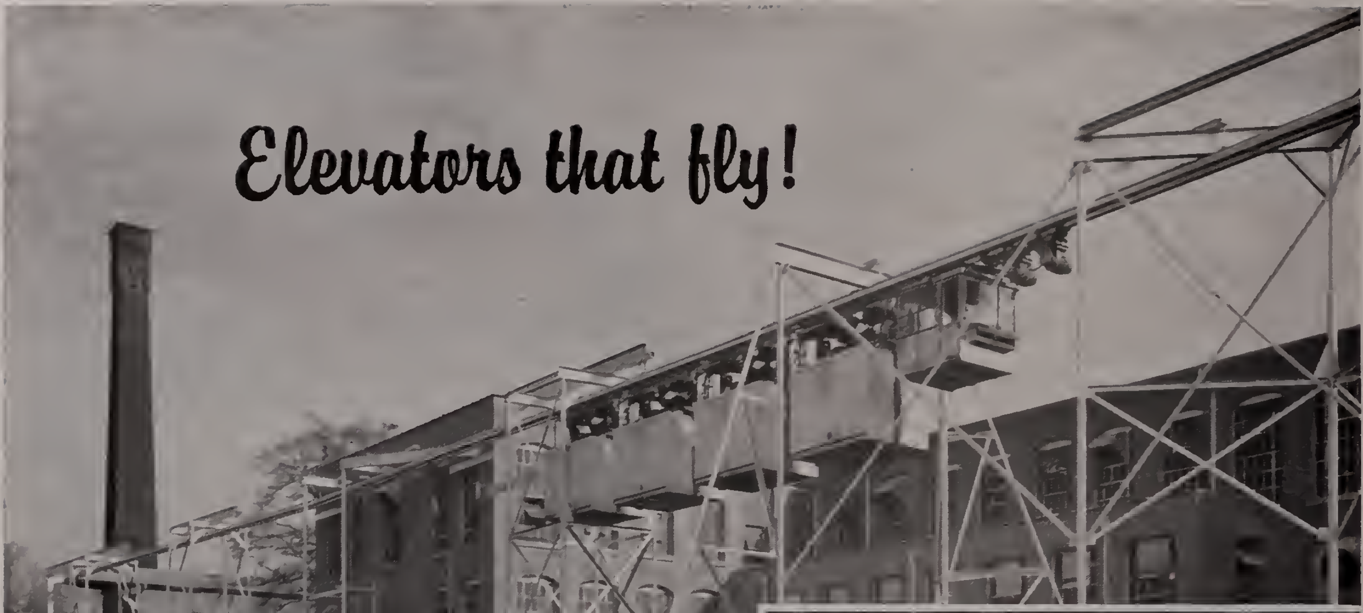

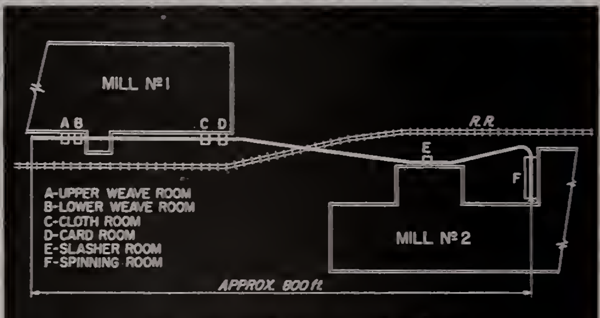

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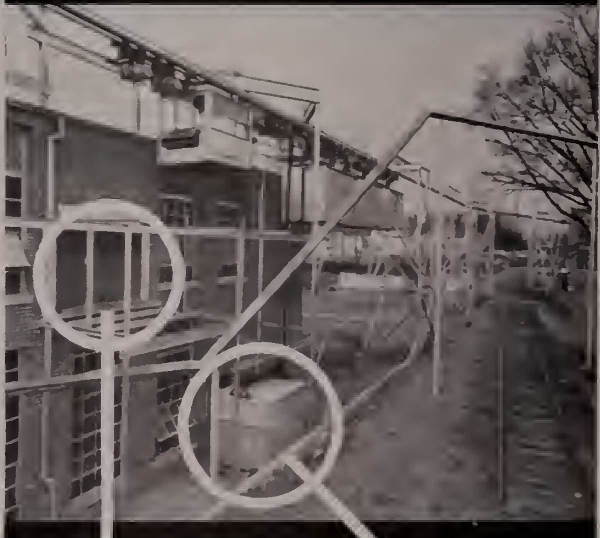

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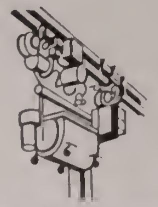

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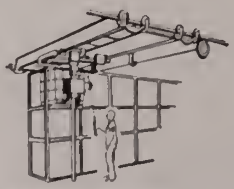
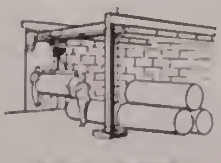
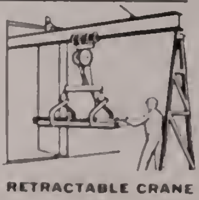


STACKER CRANE



MANUAL MONORAIL



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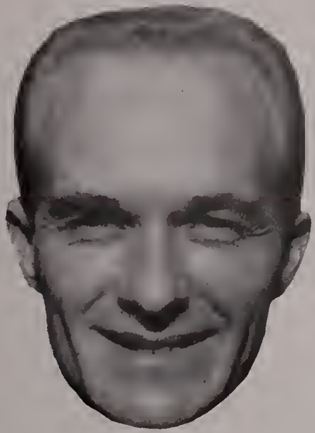

Harold R. Hutto, a textile engineering major, is from Rock Hill, S. C. Harold is a veteran, having served for four years with the Navy as an aviation storekeeper.

He was a member of the Central Dance Association during his junior year and is Vice-President this year. He has had honors this semester. Harold is married and has worked for two years at Rock Hill Printing and Finishing Company. His hobbies include golf and tennis.

Harold plans to enter the technical service branch of the textile field when he graduates.

Edwin T. Smith is a textile manufacturing major from Startex, S. C. While at Clemson, Edwin has been a member of Phi Psi during his junior and senior years, and is advertising manager of THE BOBBIN & BEAKER. He received honors during his sophomore year and first semester this year.

While he was in high school, he worked for one and a half years in the cloth room of Startex Mill. Edwin has worked in the cost and standards departments for three summers.

Edwin plans to enter the production end of textiles upon graduation.

Burts Bonner Pratt, Jr., a textile manufacturing major, is from Liberty, S. C. Burts served four years with the Navy. While at Clemson, he has been a member of Phi Psi during his junior and senior years. His hobby is model airplanes.

Burts has worked one summer at Woodside Mills in Liberty. He plans to enter the production field upon graduation.

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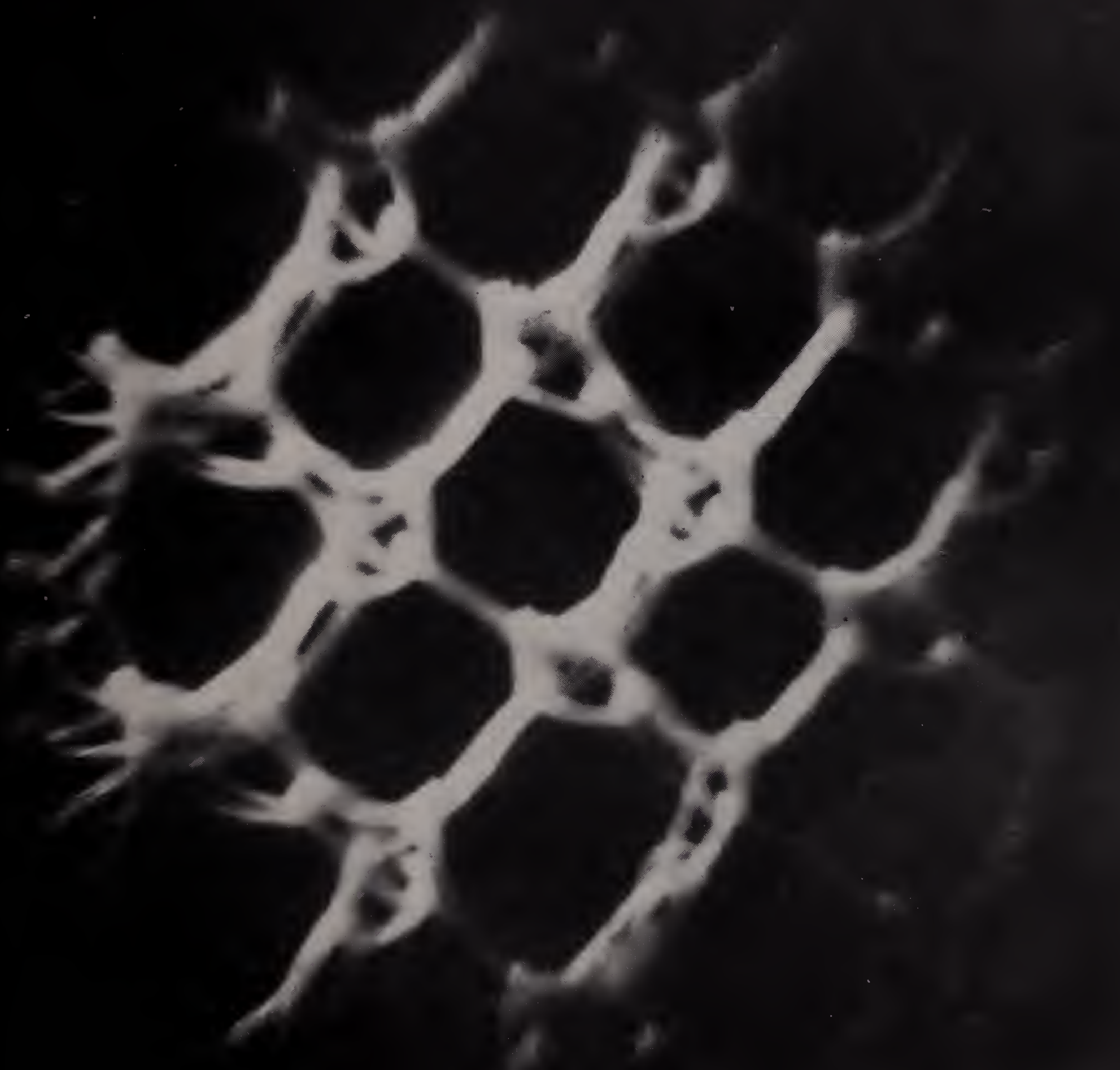

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COVER: A microscopic photograph of a knitted fabric showing the interlacing of the yarn.

Photography by Brogdon Nichols; Layout by Ted Pappas.

THE BOBBIN & BEAKER. Organized in November, 1939, by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge four times during the school year by students of the Clemson College School of Textiles. All rights reserved.

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School of Textiles

CLEMSON SCHOOL OF TEXTILES

Located strategically in the heart of the South, Clemson has kept in touch with its educational needs and has been a rallying point for the social and industrial progress of several generations. It was natural, then, that when the textile industry began to realize the advantages of bringing the units of that industry in closer contact with the sources of raw materials, particularly cotton, they should turn to Clemson for leadership in solving problems inherent in such an important move. The response was enthusiastic.

By 1898, when only a fourth of the textile industry was in the South, a textile building was completed at Clemson, modeled after the typical mill construction of the period and the first textile students were enrolled. By 1900, when there were 28 Clemson graduates, four were textile majors.

These young men went out to prove to the textile industry that training was an advantage, not only to themselves but to those who employed them. By the 1930's the enrollment was 300 students, and the textile industry was eagerly seeking qualified graduates from Clemson School of Textiles to fill positions that were formerly achieved by years of laborious endeavor.

The technical requirements of the industry were advancing by leaps and bounds, mechanically, chemially, and in every other respect. Research, much of it done at Clemson, was extending the knowledge of fibers and manufacturing processes.

The old building, built in 1898, its basic equipment, and the teaching staff were outgrown. As a result in 1938 the School moved into Sirrine Hall, the commodious new building that now houses the Textile

School. This building is an ornament to Clemson College, having more than two and a half acres of floor space, and would probably cost more than $2,000,000 at present construction prices.

EQUIPMENT

Immediately after the war, machinery was purchased with approximately $50,000 from the Legislature, and in 1950 there was an overall expansion expending nearly $200,000 which was given by friends in the industry in addition to the donations of equipment approximating $20,000. These expansions, with the machinery moved from the old building, gave the School ample equipment worth approximately $1,500,000 for training all types of textile processing from raw fiber to finished fabric. Instruction is given on cotton and all types of fibers, including wool in the American Worsted System. Modern testing laboratories having the latest types evenness testers, uniformity analyser, strain gage testing devices and other modern equipment are used both for instruction and research.

This is a fine opportunity to express appreciation for the wonderful co-operation our School has had with all the various machinery manufacturers who very carefully helped us fill our needs for this modern plant. A list of the equipment and corresponding companies is another item submitted today.

FACULTY

The faculty has grown since 1936 from fifteen members to an average of twenty-six during the period 1950-56. Of the faculty four have their Doctorate degrees and sixteen have their Master's degrees. Practically all have had considerable experience in the industry, ranging from three to ten, or more, years before coming into the Textile School.

Sirrine Foundation—To make it possible to have a highly qualified staff in the School of Textiles, the industry-supported foundation was established during the war. The funds in this foundation have been contributed by the textile companies in the State and now total over a million dollars. The income from this large fund is used exclusively for the School of Textiles at Clemson primarily to improve the teaching staff. Under the present plan, the the School of Textiles is benefiting in five ways: (1) Enhancement of the retirement payments by the State for all members of the staff retiring with the rank of asociate or full professor; (2) The Foundation contributes half of the salary for an "Extra Professor" in each of three departments. The additional faculty members have research projects but take classes for short periods to enable the regular teachers to visit mills, attend conferences, etc.; (3) The Foundation greatly increases the travel funds to facilitate visitation and study of the mills in the State; (4) Foundation funds have been contributed for maintaining a textile division of the Main Library in Sirrine Hall. The contributions provide for the salary of a librarian and an annual allotment for books and equipment for the library.

ENROLLMENT

The enrollment at Clemson has increased from third place in 1946 to first place in 1950 and the average enrollment from 1950 to 1956 has been 537 students, which is the highest of any of the ten United States textile schools. The enrollment at present is 328. In line with what is hoped will be a temporary trend in all the American textile schools the enrollment has fallen off from the high levels around 1950-52. At that time Clemson School of Textiles had one-fourth of the students enrolled at Clemson and one-fourth of the total enrollment for the ten American textile schools. A strong recruitment program is underway that is expected to greatly increase the textile enrollment in the next year or so.

ORGANIZATION

The School is organized in four main divisions corresponding with those found in industry: Yarn Manufacturing, Weaving and Designing, Textile Chemistry and Textile Management.

The **Yarn Manufacturing Department** is a service department in the School of Textiles. There is no degree offered by the department but all students in the School take courses in the department.

This department has the usual functions of supervising teaching, advising on curriculum and acting as an administrative unit of the College. This department carries on its share of the research work done by the School.

The courses in this department are divided among opening and cleaning, carding and sliver preparation, roving and spinning.

Yarns of various kinds are processed, both for teaching purposes in the Yarn Manufacturing Department and for the use of the Weaving and Designing Department and for the Textile Chemistry Department. The department is equipped to process cotton, worsteds and the various man-made fibers.

The **Weaving and Designing Department** is a service department in that it teaches courses required for graduation in Textile Engineering and Textile Manufacturing. No degree in Weaving and Designing is offered.

The main objective of this department is to train men for leading positions in the textile industry. Positions which may result directly from courses completed in this department are Fabric Designer, Overseer of Weaving or Supervisor in a knitting plant. Of course, these are not ultimate goals of our graduates. Training, as a whole, is received from various departments which make it possible for graduates to rise to high positions in the textile industry such as Managers and Vice-Presidents.

In subject matter, this department deals with the principles of weaving and knitting design and the construction of various types of fabrics with respect to texture, design, color, appearance and end use. Patterns range from small stripes and figures on dobby looms to large flowered designs on jacquard machines. Some of these fabrics are drapery, dress goods, bedspreads, curtain marquisettes, upholstery cloth and knit goods. Yarns used in these fabrics include cotton, filament rayon, nylon, acetate and blends of these fibers.

This department is also concerned with the preparation of yarns for weaving and knitting. Throwing includes processes for preparing filament synthetics for weaving or knitting. Warp preparation includes the necesary processes to strengthen warp yarn and put it in a form required for weaving.

In all these processes of yarn handling and fabric development, the mechanical aspects of the machines are studied as well as the thread manipulation.

The **Textile Chemistry Department** is different from the other divisions of the Textile School in that it offers its own degrees, both graduate and undergraduate, as well as functioning as a service division for the other departments of the School.

The curriculum in Textile Chemistry is planned especially to prepare students for positions of responsibility with any concern which processes textiles chemically, or which supplements the great textile industry from a chemical point of view. The strength of this curriculum is pointed up by the fact that in textiles and its related fields we have records of many men who today are in highly responsible positions including many presidents and executive officers. This is more especially outstanding because the oldest graduates of this curriculum are just now reaching the forty-five year bracket

Because of ever advancing developments in the field of textile chemistry, trained men for research, development and production are extremely essential. This is no longer a mere routine business of dyeing and printing so many thousand yards of cloth a week, but today is a field of constant and often dramatic new ideas which change ordinary cloth into sparkling prints and solid shade fabrics which have high style attractiveness, coupled with remarkable serviceability. In addition to special finishes, the ever-broadening field of man-made fibers continues to offer additional opportunity and challenge to young chemists. The fibers which are not on the market are by no means the final word in this area, because the producers of these fibers find by tailoring synthetics to more and more specific uses, they can open the door to a multitude of new ones.

Since South Carolina does a higher percentage of chemical processing of textiles than any other state, and since more chemists are employed in textiles and its supplementary concerns than in any other field in South Carolina, it seems essential that this major segment of our economy be properly staffed so that the State may maintain its leadership in this direction.

The **Textile Management Department** has the responsibility for the instruction in all phases of management function in the industry. The courses include practical mill management, textile costing, quality control and time and motion study. In this department are also grouped strong courses in physical textile testing and textile microscopy.

Considerable research is carried on, one professor devoting most of his time to X-ray studies of textiles and another full time on applied research in textile processing and testing machinery.

In addition to the work offered in the four textile departments, all students are given a strong academic background in the other schools on the campus.

CURRICULA

The Clemson School of Textiles offers three courses leading to the degree of Bachelor of Science: Textile Chemistry, Textile Engineering, and Textile Manufacturing. A full major in Knitting is offered as an option under Textile Manufacturing. Graduate work leading to a Master of Science degree is offered in Textile Chemistry and Dyeing.

Textile Chemistry: The work of textile chemists includes the various phases of textile coloring, bleaching, printing, dyeing and finishing of textile yarns and fabrics, as well as the manufacture and sale of dyestuffs. Graduates have positions such as Bleachery Chemist, Dye Foreman, Designer, Laboratory Chemist, Textile Chemist, Research Assistant and Sales Representative.

In Textile Chemistry the School offers graduate work leading to a Master's degree and has two teaching fellowships and two sponsored fellowships.

Textile Engineering: Students following this curriculum receive instruction in basic textile courses for a total of thirty-six college credits; the remainder are in Physics, Mathematics, English, Economics, and Mechanical Engineering. Graduates in this curriculum are prepared to enter the research and development fields which are being emphasized by the textile industry as well as the field of production. They are also prepared to go forward with post-graduate studies.

Textile Manufacturing: This curriculum is followed by those textile students who intend to enter the production and management phases of the textile industry. Those students who desire training in the knitting field may elect to take the knitting option under Textile Manufacturing during the junior and senior years. The curriculum shows that they receive sixty-five of their college credits in subjects taught in the Textile School and that they are well prepared for rapid advancement in textile plants. It is recommended that all textile under-graduates find work in textile mills during summer vacations. This experience always aids them in their upperclass textile courses and also allows the students to make contacts with possible future employers.

Knitting Option: This option for the junior and senior years has been set up under Textile Manufacturing to embrace every phase of the knitting industry. Students will study such fields as circular body knitting and design, circular hosiery knittting and design, flat and warp knitting, full-fashioned knitting, knit garment manufacture, dyeing and finishing of knit goods, and knitting mill practices. Because of the selected courses in this curriculum, students will not only be prepared for the knittting industry, but for almost every other field in textiles, especially yarn manufacturing.

RESEARCH

Over the last decade, the School of Textiles has increased its emphasis on various types of research. Under the Sirrine Foundation more than half of the faculty are enabled to engage in research each summer, and have carried on a large number of projects. Most of these are of applied research character but some are of more fundamental type.

During the past eight or nine years the School has accepted contract research, having several projects a year, which have amounted to approximately $200,000.

These programs have included evaluation studies of fibers, yarns, sewing threads and fabrics from various types of natural and synthetics fibers. A good proportion of the work has been on investigations of dyeing, sizing, resin coating, etc. A few of the contracts have been for machine and testing equipment development.

Besides the sponsored research and that supported by the Sirrine Foundation, the School has carried on a continual program of developments of testing equipment and textile machinery improvement. These have resulted in patent searches on more than fifty items of which twelve have been patented and applications pending on a dozen or so more. Several of these developments have been taken by machinery companies for manufacture and sale to the industry. All patents are assigned to the College, which will receive nominal royalties from the companies manufacturing the items for the industry.

OTHER AGENCIES

Due to Clemson's central position in the Textile Industry, a number of the other agencies have located at Clemson College. These include the following:

(1) One of the large U.S.D.A. Production and Marketing Administration fiber and spinning research laboratories, in charge of Mr. J. T. Rouse is located in the school.

(2) The Division of Technical Service of the American Cotton Manufacturers Institute, in charge of Mr. John T. Wigington, has been at Clemson since 1941. With Mrs. Helen Beasley as Fiber Technologist, the division operates a modern cotton fiber testing laboratory for technicians in cotton fiber testing.

(3) The U.S.D.A. Southeastern Cotton Ginning Research Laboratory, in charge of Mr. J. A. Luscombe, is located at Clemson to study the effect of ginning methods.

(4) The U.S.D.A. Extension Service makes Clemson College headquarters for a Cotton Utilization Specialist, Mr. William J. Martin, who carries on liaison work between the Southern Regional Research Laboratories and the Textile Industry and disseminates information from the textile schools and various cotton research groups.

The School of Textiles is very forutnate in having all these agencies located at Clemson and is aided greatly by the close cooperation of the school faculty with these research staffs.

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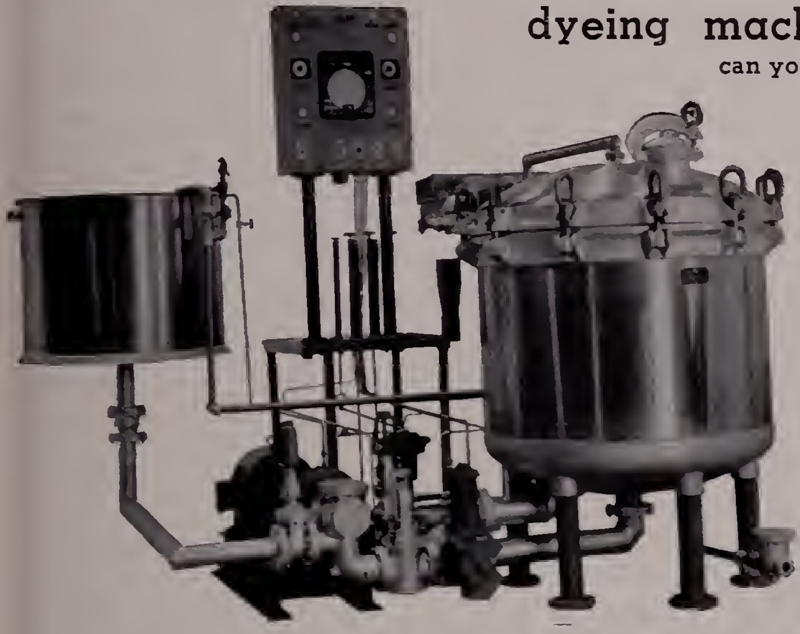

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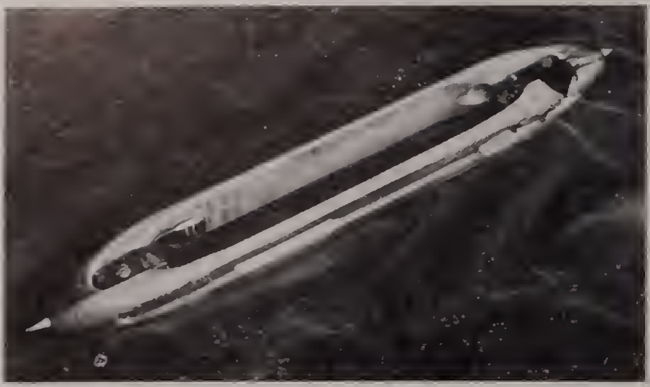

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By G. D. McGill, Southern Product Manager
Steel Heddle Manufacturing Co., Greenville, S. C.

Sometime ago it became apparent that increased loom speeds, heavier fabrics, and the growing scarcity of acceptable dogwood blocks (the material from which loom shuttles are ordinarily made) were creating an ever-growing need for some material for the manufacture of loom shuttles. Better than 15 years ago the Southern Shuttles Division of the Steel Heddle Manufacturing Company began their development of this radical improvement. The search for an acceptable material, exhibiting the required physical properties, has been going on since that time. Approximately 3 years ago this long and arduous experimentation finally bore fruit in the form of the development of the material from which the present-day Southern DURAMOLD shuttle is molded and manufactured.

Prior to that time this experimentation had touched upon the possibility of using almost every imaginable type of plastic material-all-macerated, all-fabric, paper-base, flock-filled, pure resin, etc. Numerous and exhaustive tests were run, also on every conceivable resin formulation; the UREAS, MELAMINES and rubber phenolics, to mention a few. Some of these combinations had in their initial testing looked very promising, but more exhaustive subjection to the rigors of loom operations always showed material weaknesses, and material variations, which developed into premature failures. One by one each of these test formulations had to be discarded as unsuitable.

Several years ago it became irrevocably apparent that fabric reinforcement of the side wall sections of any molded shuttle was necessary to withstand the abuse imparted to the shuttle by the loom. This has been the basis of all recent experimentation. However, in the past, all-fabric protypes had been worked with and had been found unsuitable due to their brittleness in the center sections, and their inability to properly receive the shuttle tip. For these reasons it has also become apparent in recent years that a center section of macerated material was preferable when the block was molded.

This is basically the construction of the present Southern DURAMOLD shuttle. The wall sections of this shuttle are reinforced with multiple laminations of tough, strong, wear resistant fabric, while the center portions are molded with reinforcements of more-resilient, macerated or chopped fabric. This combination has been proven to be optimum construction for greatly increased shuttle life.

The present-day DURAMOLD shuttle is molded for Steel Heddle by The Westinghouse Electric Corporation, at their plant in Hampton, South Carolina. While the molded blanks themselves are a combination of two hetrogenous materials in their raw form, they become upon molding, through the intense heat and pressure applied, one homogeneous unit when they immerge from the mold. The flow of the phenolic resin used in molding causes a uniform mass throughout the entire shuttle blank, and leaves it without bond lines or seams. Much work has been done over recent years to determine the proper fabric for use in reinforcing the side walls, and also for use in the chopped state to reinforce the center section. The fabric presently used in the Southern DURAMOLD shuttle has been proven by exhaustive testing to be best suited to this end.

The advantages of the DURAMOLD shuttle as compared to the conventional dogwood shuttle are many:

1. The increased wear resistance of the material radically improves the life expectancy of the shuttle.

2. Due to the improved toughness of the material, the majority of premature failures through fracture, etc., are removed.

3. By the very nature of the material the variations brought about by atmospheric change in temperature and humidity, which so often plague the weaver, are eliminated.

4. Because the materials have no granular structure, the natural defects even in good dogwood, are eliminated.

5. As the material has no grain, scarred end grain will not raise the humidity-change.

6. The nature of the material causes it to become smoother as it wears, thereby reducing the amount of sanding necessary during operation to obtain a satisfactory finish.

7. In most instances the slight increase in weight is beneficial to the weaving operation as power settings on the loom can be backed off.

8. The much denser nature of the material allows for more precise and longer-lasting fit of the component parts into the shuttle, thereby reducing eye-rocking, loose-grips, etc.

Repeated large-scale loom applications have proven that the DURAMOLD shuttle will outlast the conventional shuttle 3 times or better, enabling very marked savings to be effected in the overall shuttle costs per year to various mills. The economic operation of these shuttles has been proven time and time again, and their use has resulted in reduced costs and improved quality in each application.

Finally, it should be stated that the DURAMOLD shuttle can no longer be considered in the light of an experiment. Its adaptability and economic acceptance has been proven and numerous mills are at present replacing their conventional shuttles of this type on a large scale. Many mills have completely equipped their looms with this radically improved unit, and are extremely pleased with the results and savings being received from their use. The units presently in the field number many thousands and orders for the Southern DURAMOLD shuttle continue to grow at a most gratifying rate.

At the present time, due to mold considerations, the Southern Shuttles Division of the Steel Heddle Manufacturing Company is limited in what they can supply to certain looms running shuttles in the medium size range. However, work is constantly going on to develop new molds, and it is expected shortly that we will reach the state where we can produce in the DURAMOLD material any shuttle for an automatic, filling-replenishing loom.

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A New Idea In Filling Preparation

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Basic Explanation

UNIFIL brings the whole process of filling preparation into the weave room and integrates it with the loom. It is not merely an attachment; nor is it only a winding machine. It is a mechanism designed and built right into the loom itself. It performs the following cycle of operations automatically:

1. It winds.
2. It transfers to the shuttle.
3. It strips.
4. It returns empty quills to the winder.

In so doing it presents economics and quality improvements impossible to achieve with any combination of conventional equipment, automatic or otherwise.

The **UNIFIL SYSTEM** replaces the present rotary hand-filled battery on the automatic loom.

QUILL HAULING and **BATTERY PLUGGING** will be eliminated completely.

THE WEAVER will tend Unifil, thereby centralizing responsibility.

THE LOOM FIXER will do normal fixing on the Unifil.

A UNIFIL FIXER will be required for major overhaul of the unit. (a unit can be replaced in two minutes.)

BOBBINS will be altered to incorporate small wire cleats to pick up the end.

There should be a very real saving in the annual cost of bobbins. The Unifil uses 14 bobbins at any one time. This compares with from 300 to 400 bobbins per conventional loom.

Will UNIFIL Improve My Quality?

Unifil can improve quality in many ways:

a) **LOCALIZED SUPPLY** — large cone at the loom.

b) **CONTROLLED TENSION** — bobbins wound by same tension.

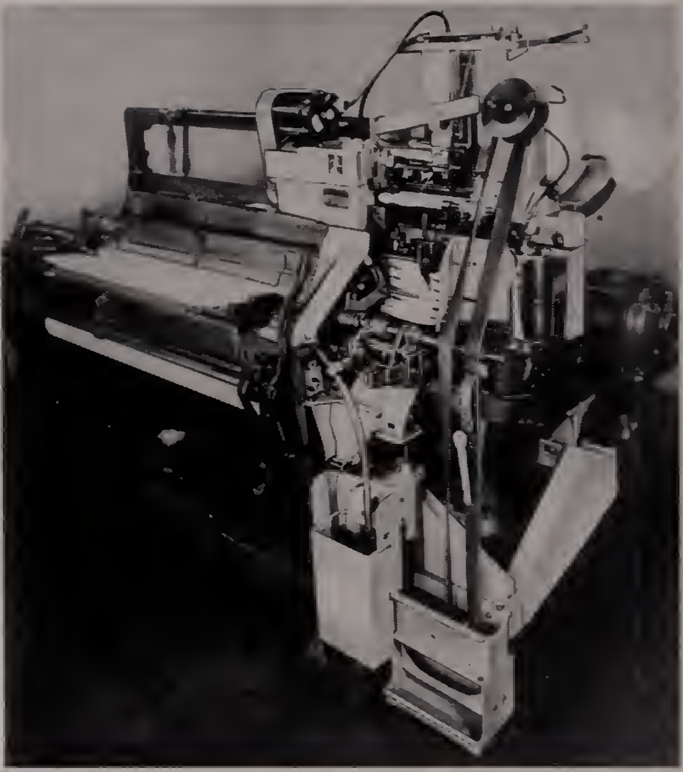
c) **HAND SOILAGE** — eliminated.

d) **MIXED FILLING** — eliminated. The elimination of manual handling insures clean filling and reduces the possibility of shell-offs.

e) **SCATTERING OF BAD QUILLS** and yarn throughout weave room eliminated.

f) **EFFECT OF YARN DIFFERENTIAL** from outside to inside of supply package minimized.

All the above factors point to improved fabric. There will be a marked reduction in filling bands—particularly important in colored and loom-finished goods. An over-all upgrading of cloth should be possible and, in some cases, a premium price will result. The president of one of the mills now running UNIFILS has given us permission to quote him as saying that UNIFIL eliminates chafed filling and filling bands encountered with conventionally prepared filling.



Versatility

UNIFIL will prove extremely valuable to mills producing a wide variety of fabrics. The problem of inventory control is minimized. All that is required when changing filling is to change the supply package, the tension, and the increment feed which regulates the diameter of the bobbin.

Waste

UNIFIL will reduce waste in several different ways. Hand soilage will be minimized because bobbins are no longer handled individually.

Waste at the leading end of the bobbin is minimized. A consistent length of yarn is drawn from the nose of the bobbin and held in the drum and the transfer clamp. At transfer this length of yarn is picked up by the aspirator and deposited in the waste container. Bunch waste can be closely controlled as all bobbins go to the same loom and the factor of safety to insure against runouts can be decreased. It should also be remembered that all UNIFIL waste is clean and high grade and easy to sort, where desired. We have evidence that up to 50 per cent less waste will be made on the UNIFIL SYSTEM than on the conventional.

Loom Efficiency

In our limited field tests we have not been able to prove increased loom efficiency. However, our tests. have shown less filling stops. In view of this, we feel that production installations will appreciate an increase in efficiency.

Just What Is UNIFIL — Mechanically?

We have told you the four basic functions of UNIFIL. In order to perform these operations, we have developed the following mechanical components which are brought together—on the loom—to give a completely automatic system:

A. **A Supply Creel:** A one to six pound supply package is used as a supply to the UNIFIL, and from there the filling is never touched. Inasmuch yarn comes in the form of cones, cheeses, bobbins, pirns, etc., we have provided means for utilization of any conventional supply package. The normal set up is that of a magazine creel in which two packages may be tied together, thereby giving a long running time and making less critical the time of supply tie-in.

B. **An Empty-Bobbin Magazine:** This magazine feeds the new, clean bobbins to the winder unit.

AWinder Unit: The heart of the system—a completely new unit for winding consistently uniform bobbins right on the loom, and synchronized to the loom speed.

1) **Bunch Control:** It is well known that control of bunch is important, and therefore, we have designed a bunch builder giving extreme accuracy and control of bunch waste. This is entirely mechanical in operation and works as a time function.

2) **Avoidance of "Tails":** Conventional systems invariably create the problem of uncontrolled tails on bobbins usually due to the fact that the tail is gripped in the bobbin chuck and later removed. Inasmuch as our system employs an entirely different means of starting the winding, we have no tail to become troublesome in the shuttle, thereby completely avoiding the problem.

3) **Clean Yarn:** By avoiding any handling of yarn from start to finish of the bobbin cycle, we have completely sidestepped the problem of bobbin soilage due to handling. The full bobbin is carefully held so that it is delivered to the shuttle without soiling. Furthermore, extreme care has been exerted in the design to prevent oil leakage from the mechanism. The interior of the winding head, which is oil lubricated, contains a carefully thought out system of oil slingers, hardened and polished shafting, and oil seals to prevent seepage. Furthermore, as a safeguard, the entire mounting is designed with a reservoir to catch any seepage, should it occur. In this way the lubricant is entirely isolated from the loom, and it is fe that every conceivable safeguard has been taken t prevent damage to the cloth from this source.

4) **End Control:** Because of the fact that the automatic cycle depends on complete control of the end at all times, we have designed special mechanisms to make sure that the end is not lost. For example, when transferring a full bobbin from the winder spindle to the full bobbin magazine, both ends are carefully gripped, so that they may be re-engaged at the next instant. These mechanisms have undergone design and redesign to make them as foolproof as possible, and at this reading we feel completely satisfied that they are not a source of trouble.

D. **A Full-Bobbin Magazine:** To store and feed the wound bobbins to the loom as required. In order to provide the loom at all times with an adequate supply of bobbins prepared ahead, our mechanism is designed so that the winder will provide this reservoir and then shut off. This enables the winder to "relax" periodically and still keep the loom supplied.

E. **A Stripper:** To receive the bobbins as they are ejected from the loom and to strip the bunch cleanly.

Inasmuch as the mechanism is required to strip off bunch waste and present a clean bobbin to the winder, it has been most important to obtain a high degree of efficiency in this stripping operation. Furthermore, we have carried a design a step further to provide a safeguard in the event that stripping may not be 100 per cent complete. This safeguard takes the form of a special detecting mechanism, which will automatically reject for operator attention any bobbin which has not been cleaned correctly.

F. **Build:** The build of the bobbin is accomplished by a 1¾-inch traverse empolying either 5, 7 or 10 winds. Winds can be changed by changing gears in the housing.

Doffing The Full Bobbin

At the completion of the winding operation, the traverse bar thread guide moves against the sizing rod trip lever, and in activating this lever, the thread guide is lifted out of engagement with the traverse bar and the following action takes place:

1. The eccentric on the cam shaft releases the bobbin support.
2. As a result the clutch is released and the spindle is stopped through a braking action applied by the bobbin driver against the bunch builder bracket.
3. The traverse cam, driven directly from the spindle through a chain of gears, also stops.
4. By the action of the sizing rod being tripped, the cycle pin clutch wedge control latch is released and in the event of a completely filled full bobbin magazine, the cycle of the winder is arrested by an interlock mechanism and no action takes place. In such cases, the winder will cycle at the completion of the next loom transfer. However, in the event of a partially filled full bobbin magazine, the winder will cycle immediately upon the completion of a full bobbin in the spindle.

5. The cycle cam which is now in operation causes the bobbin support to retract far enough to allow the full bobbin to drop out of the winding position onto the Rest Plate of the full bobbin magazine.

6. The upper and lower grips advance from either side and proceed to clamp, cut and retain the yarn which runs from the full bobbin on the rest plate back through the thread guide and tension to the supply.

The lower grip and shear assembly with the end from the full bobbin continues to travel in an outward direction, depositing the end on the yarn tensioning drum. The end is clamped on the drum, released by the lower grip and shear assembly and held in place until the drum tooth transfers it to the outer surface of the rotating drum. The end traverses down the drum to coincide with the full bobbin in the full bobbin magazine.

The upper grip, meanwhile, carries the supply end of the yarn inward to a position in line with the cleats of the empty bobbin which has moved into the winding position. During this operation, the thread guide is retrieved by the upper grip carrier to the bunch building position. The bunch builder is then cocked and bobbin is started. As the bobbin begins to revolve, the yarn is engaged in the cleats and the end is pulled from the upper grip. The upper and lower grips return to their normal positions and the cycle is complete.

NOTE: While the above operations are outlined as a sequence, they should not be considered as such since many of the operations are being performed simultaneously.

Full Bobbin Magazine

As previously mentioned, the full bobbin is held the rest plate until the lower grip has made its outward traverse and end is deposited at the tension drum.

The rest plate is then depressed, allowing the full bobbin to drop by gravity into the full bobbin. magazine. This drop is retarded by a counterweight, located in the lower part of the magazine chute, to correctly position the full bobbin. A butt clamp is provided to prevent rotating or excessive movements of bobbins in the full bobbin magazine and is retracted during the transfer of the loom or the winder to facilitate repositioning of the bobbins.

Loom Transfer

When the feeler has indicated that the bobbin in the shuttle is ready for transfer, the action of transferring is accomplished in exactly the same way as is performed on a conventional Draper Loom, utilizing existing parts with the exception of the transferrer hammer.

The end of the yarn of the bobbin in the transfer position in the full bobbin magazine extends through the yarn clamp which is in its open position. When the transferrer hammer is actuated and places the full bobbin in the shuttle, the yarn clamp is closed and holds the end during the first pick. As the lay moves toward the front center, the clamp is recocked and the drum end transferred into a secondary clamp which positions it slightly lower than the bottom of the tension drum. Since the drum continues to rotate, the end works off the bottom but is still retained by the secondary clamp. In the meantime, the end from the yarn clamp together with the end held by the Stafford cutter are cut by the selvage cutter and dropped into the path of the suction clearer. These ends are held in their respective positions until the next loom transfer, at which time they are released and deposited in the waste container through the air clearer system.

Stripping

As the bobbin is transferred out of the shuttle, it contacts a shutter rubber inserted into the back wall of the shuttle directly below the ring clamp. This shuttle rubber imparts a spinning motion to the bobbin and increases the length of the trailing yarn end, important to added efficiency in stripping.

After the empty bobbin has been ejected and enters the receiver chute, it is guided through a series of brushes to trap the trailing end of yarn and continues its downward movement, coming to rest on the bobbin safety latch. It remains in this position until such time as the bobbin stripper ejector activates the bobbin safety latch causing it to be withdrawn and thereby allowing the bobbin to drop to the stripper floor where it remains until the ejector returns and pushes it into the stripper bobbin guide clamp where it is held for stripping.

Since the bobbin, when ejected from the shuttle, has a trailing end which has been cut by the Stafford thread cutter, this end is picked up by the bristles of the revolving brush as the ejected bobbin passes through it and the end is carried over the revolving stripper cone. The yarn is caught under one of three pick-up fingers which in turn cause the yarn to be wound onto the revolving cone. The three cleaning fingers of the cone oscillate inward and outward thereby pushing the yarn off the cone into the waste collector of the stripper.

The bobbin remains in the stripping position until the next bobbin drops to the floor of the stripper and this latter bobbin is moved into the clamp position by the ejector. The stripped bobbin is then advanced to an intermediate position and the bobbin from the intermediate position is forced forward into a caliper device. This device detects bobbins which still retain yarn, either as a result of a break during stripping or early transfers, and holds them in this position until another bobbin enters the stripper clamp. At this time, the unstripped bobbin is advanced and falls into a chute and drops into the reject tray, removing the bobbin from the conveyor system. If on the other hand, the caliper detects no yarn on the bobbin tray from whence it is picked up by the magnetic bobbin lifter and returned via the conveyor system to the empty bobbin magazine.

The Conveyor System

The conveyor system constitutes an endless belt, with magnetic lifter, running from the stripper to the empty bobbin magazine. The conveyor is driven from the stripper whose power is derived from the loom cam shaft by a belt drive. In turn the conveyor system powers the tension drum through a flexible shaft connected to the upper conveyor pulley.

Total Bobbins Per Unit

Fourteen bobbins are required per loom for loom winder operation. These bobbins are scheduled for use in the following manner:

Empty bobbin magazine	4
Winder spindle	1
Full bobbin magazine	6
Shuttle	1
Stripper	2

The bobbins used are standard bobbins with starting cleats added.

Tending

We might break down the essential operations to be handled as follows:

a. Yarn Hauling
b. Creeling
c. Waste Removal
d. Tending Misses
e. General Inspection
f. Routine Maintenance
g. Failure Corrections

The breakdown of these duties might fall in the following manner:

1. Weaver handling all tending of misses and general inspection.

2. Cone creeler to handle everything connected with preparation of filling and waste removal.

3. Loom Fixers to handle routine maintenance at the loom, replacing unit when major repair work is necessary.

4. Unifil Fixer specifically trained to handle major repairs, overhauling and assist loom fixers for a large quantity of units. If this were not possible, major repair work could be done by Universal Winding Company, either by returning units to the plant in Providence or by Servicemen at the mill.

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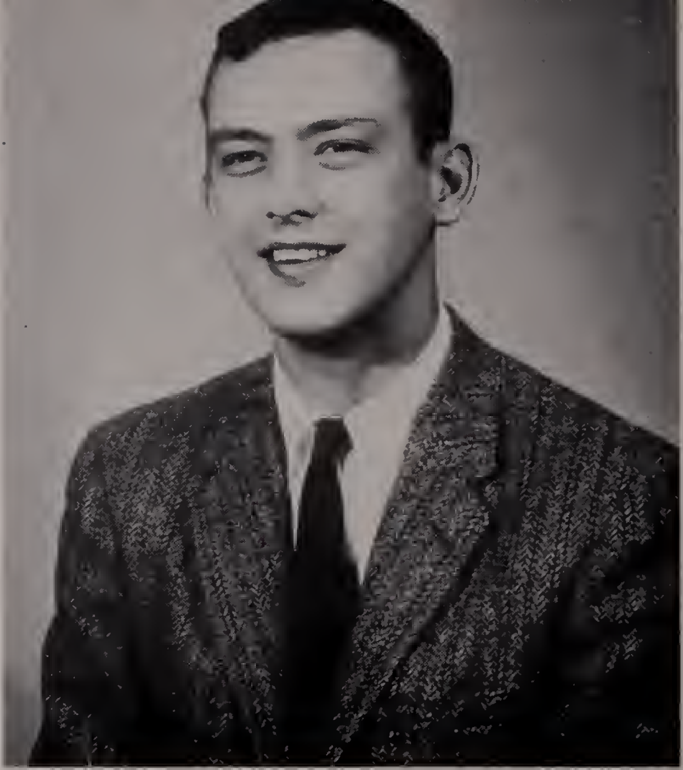

The purpose of the textile school's magazine, THE BOBBIN & BEAKER, is service to Clemson's textile students and also to be used as a medium of exchange for mill men who wish to express their views on subjects which are associated with the industry.

In return they receive through reading this magazine the thoughts of others who participate in this exchange of articles. All persons who receive THE BOBBIN & BEAKER, approximately 2400, acquire essential information concerning new developments in the industry that occur most frequently in these times of mechanization.

This has been the purpose of this student publication since its beginning and the old staff has successfully completed its endeavor. It is now our duty, the new senior staff, to prove ourself by supplying the readers of this magazine with interesting and necessary facts at the time they are developed. We will endeavor to accomplish this task.

The new staff, as shown below is headed by C. E. Griffin, a textile manufacturing major from Forest City, North Carolina, as Editor. The new Business Manager is H. E. Jennings, a textile manufacturing major from Newberry, South Carolina. J. C. Glasgow, a textile engineering major from Conway, South Carolina, will serve as Circulation Manager, and C. T. Sanders, a textile manufacturing major from Richburg, South Carolina, will be the new Advertising Manager.

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REPRESENTATIVES OF SIX NATIONS STUDYING AT CLEMSON SCHOOL OF TEXTILES

Kenneth W. Powers '59

Pictured above are the ten foreign students enrolled in the textile school this semester at Clemson.

Three of these students are from Korea. Junekey Lee from Taegu, Korea, is majoring in Textile Manufacturing, and is on a full scholarship from La France, Park Avenue, New York. Yong Joon Lee from Seoul, Korea is majoring in Textile Manufacturing and has received honors the first semester of this year. Dong Wha Kim, who is also from Seoul, is a member of Phi Eta Sigma, the National Manufacturing Association, and the Presbyterian Student Association, has received high honors his first three semesters at Clemson, and is now on a Keever Starch Scholarship.

Imad Mohamad Nawam from Sidon, Lebanon, has received honors the first semester of his Junior year and is a Textile Manufacturing student. Jorge M. Gemayel, who has previously worked with the Draper Corporation, is from Puebla, Mexico, active in the Newman Club, majoring in Textile Manufacturing, and is starting the International Club for foreign students at Clemson. Mohammad I. Nasim is from Karachi, Pakistan and is majoring in Textile Manufacturing. Guillermo Sanchez, a Textile Manufacturing major, is from Havana, Cuba, active in swimming and the Freshman YMCA Council, and has received honors the first semester of this year.

The remaining three, Ilson Naghettini, Jose Barbosa da Silva, and Lucio Taboada Tenan, are professors from the Technical School of Chemical and Textile Industry at Rio de Janerio, Brazil. They are on a Point 4 Program Scholarship, and the main purpose of their course at Clemson is to observe the methods of teaching, the American equipment, and the relationship between the Textile Plants and the Textile School.

REED MAKERS

For Southern Weavers For 32 Years

GREENSBORO LOOM REED CO., INC.

The Westinghouse Textile School

By Wayne Freed '59

The Westinghouse Electric Corporation and the Clemson College Textile Department recently presented a technical school covering electrical drives used in a typical textile mill. The school was held Monday through Thursday, March 18-21, at the Textile School of Clemson College.

This school included the operation and maintenance of all textile drives, such as cards, spinning frames, slashers, etc., as well as AC and DC theory, AC Induction Motors, and DC Motor Theory. This show was the second of its kind held by Westinghouse, the first being held in Charlotte last fall.

The school had a seven man faculty headed by J. C. Marous, the author of the course's textbook. All instructors for the school were Westinghouse specialists. The staff included Mr. Marous and F. K. Shealy, Charlotte; S. A. Bobe and J. G. Stephenson, Atlanta; M. H. Fisher and C. P. Waker, Pittsburgh, Pennsylvania; and J. B. Wrenn, Buffalo, New York.

Marous, a native of Pittsburgh and a graduate of the University of Pittsburgh, is consulting and application engineer for North and South Carolina. Shealy, a Charlotte associate, is an electrical supervisor, with a degree from Tulane. He is a native South Carolinian.

Bobe, a Washington State graduate, and Stephenson, Auburn, are consulting and application engineers in the Atlanta offices. Stephenson, associated with the textile industry for 15 years, works primarily with range and slasher drives.

Fisher, a graduate of Auburn, with a master's degree from Pittsburgh, is manager of the General Mills Section, Industry Engineering, in Pittsburgh. Walker, a native of nearby Walhalla, is with the company's East Pittsburgh Works. Another Pitt alumnus, Wrenn is with AC Motor Engineering at Buffalo and is distinguished as a designer of Textile Motors. He taught spinning frame classes at the school.

The course was primarily for master mechanics and electricians from the various mills of this region. The first day twenty mills were represented by some eighty men. The number of representatives varied from day to day as different material was covered which was of particular interest to these men.

The only cost to the mill representatives was (1) a place to stay and (2) their meals. The course itself cost them nothing.

The students were registered and welcomed by representatives of both Clemson College and Westinghouse. Mr. J. O. Buchanan of the Greenville office acted as Moderator to keep things on schedule. The speakers, demonstrators and students had to be kept on schedule in order to cover the fifteen subjects which were included in the four day course.

The school included on Monday, DC Theory and AC Theory, and AC Induction Motors; Tuesday, Picker, Opener, and Card Drives; Drawing Frames, Lap Winders, Roving Frames, Spinning Frames, Twisters and Spoolers, and Loom Motors; Wednesday, AC Motors and Control Maintenance, DC Motor Theory, Warper Drives, and Slasher Drives; Thursday, Range Drives, Warper, Slasher and Range Drive Maintenance.

On Thursday afternoon a self-graded quiz completed the course. Then the diplomas were awarded at the final dinner which was held at the Clemson House on Thursday night. The program for the evening included L. C. Moore, Southeastern Region Engineering and Service Manager for Westinghouse as the speaker. J. J. Hill, Carolinas District Manager awarded the diplomas at the conclusion of the program.

The text of the course was "The Electrical Handbook for Textile Drives." It has long been the desire of mill personnel to have a handbook devoted entirely to textile drives because of the growing complexity of electrical drives and the extensive use of individual drives in the Textile Industry of today. Mr. Marous, the author, has succeeded in satisfying this desire by his skillful handling of the material contained in this handbook. Each drive is discussed in the order in which the product is generally processed and the information is reduced to the basic fundamentals so that it might be of maximum use to the Mill Electrician and the Master Mechanic. Simplification of this handbook is due to the extensive use of photographs, wiring, and schematic diagrams.

It was felt that this school would increase the technical knowledge of the mill representatives and assist them in development of new applications. It was hoped that attendance was profitable to the students and to the mills which they represented.

Your Future in Textiles

By H. B. Wilson
Assistant Professor, Textile School

This year the demand for textile graduates is greater than ever before in the history of Clemson's Textile School. The seniors now have a choice of numerous positions in the field of textiles and at the highest salaries ever offered.

For our graduating high school readers, you are approaching the final phase of preparation for your life's work. As you look toward a college education, you must make a decision that will determine the pattern of your life. More than two million persons are on the payrolls of the textile industry. It is the second largest industry of our country, outranked only by food processing. Just to give you a few figures that are true in the State of South Carolina—70 percent of all wages paid last year dealt directly with textiles—73 percent of all jobs dealt with textiles—75% of state taxes came from the textile industry—capital investment in the textile industry is approximately 73% of the total in South Carolina.

The textile industry will need 2500 textile school graduates in the next ten years. If Clemson and all the other textile schools combined were to turn out

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their peak production of textile graduates, it would be impossible to fill the need of the industry.

A number of textile foundation scholarships are set up by various mills to help make a college education financially possible for students who are interested in a career in the textile industry.

The following will be given major consideration in granting awards:

(1) Academic record of the applicant
(2) Character of the applicant
(3) Need for financial assistance
(4) Leadership in school activities
(5) Employment record of parent of guardian.

A number of the scholarships are available and range from $200 to $750 per year. The amount of the scholarship is usually paid directly to the college, and the difference between the scholarship payment and the total charges by the college is paid by the student. These scholarships are terminated if the student does not maintain a satisfactory record at college.

If you are interested in a career in textiles or a chance to qualify for one of the above mentioned scholarships, contact Mr. Gregg Hughes, Director of Student Aid, Clemson College, Clemson, South Carolina. If you or your parents would like to visit our Textile School, or the campus, get in touch with the writer here at Clemson.

DR. NORMA PEARSON

It is with a great deal of sadness that THE BOBBIN & BEAKER announces the passing of Dr. Norma Pearson on April 5 at the home of her brother in Baraboo, Wisconsin.

For the last several years, Dr. Pearson had done fiber work at our textile school, under the Bureau of Plant Industry, United States Department of Agriculture.

Some of our readers will no doubt recall articles in past issues of THE BOBBIN & BEAKER as well as other publications written by Dr. Pearson. She also spoke at various textile meetings over the years in her fiber work.

Dr. Pearson will be greatly missed by her many, many friends here at Clemson as well as those at other places where she was located.

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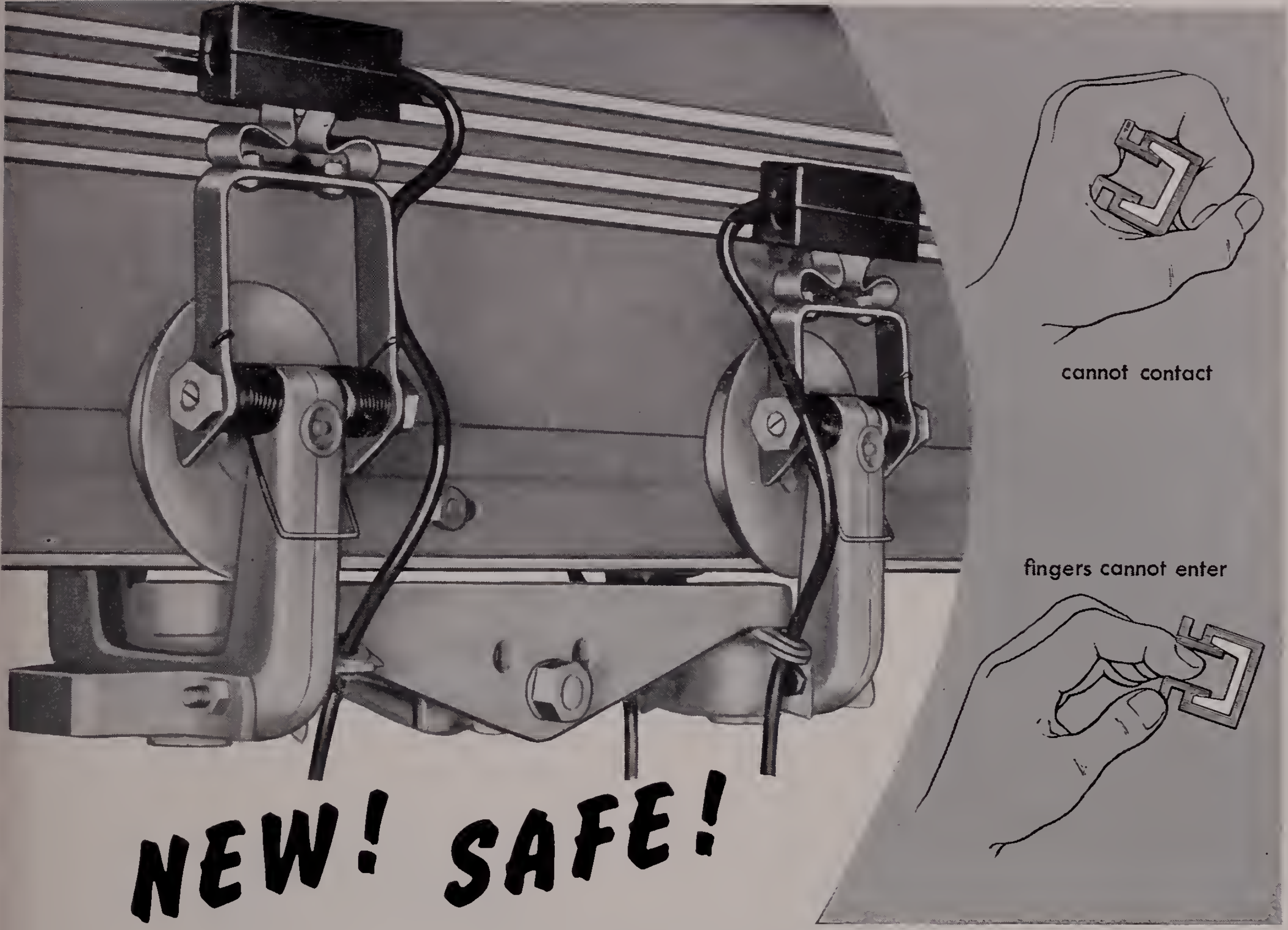

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Outstanding Seniors - -

By Wayne Freed, '59

Frederic W. Reinholdt, Jr., known to everyone as "Fred" is a Textile Manufacturing major from Chetex, Wisconsin.

Fred has gotten his experience in the textile field by working in the summers with the Joanna Western Mills in Chicago, Illinois. Besides gaining valuable experience in the workings of the textile industry, Fred's summer employment is also helping to pay his way through school.

Much of Fred's school activities are tied around his association with the Air Force ROTC program. This year he is the Group Training Officer for the 1st Group with the rank of Cadet Captain. Fred also attended summer camp last year at Webb AFB in Texas, where he acted as Squadron Commander with the rank of Cadet Major. Fred has also played a major role in Clemson's marching band of which he has been a member for four years. In the marching band he acted as 1st Sgt. last year and Drum Major this year.

William T. Linton, Jr., from Columbia, S. C. is a Textile Manufacturing major. "Bill", as he is known to the students, is quite active in campus functions.

In the ROTC program, Bill is a Company Commander with the rank of cadet Captain. He is also a member of the Senior Platoon. High on the list of Bill's activities is the fact that he is at present the President of the National Textile Manufacturers Society. This list includes such things as YMCA Cabinet, Chaplain for Senior "Y" Council, Senior Representative to Student Assembly, and Social Chairman of the Presbyterian Student Association.

In his senior year, Bill has acted as hall counselor to help pay his way in school. He has also worked two summers with Pacific Mills in Columbia, S. C., to help and to gain that necessary extra experience needed in today's textile industry.

Joel Patrick Campbell, better known as "Pat" around school, is a Textile Manufacturing Major from Anderson, S. C. Pat has become familiar to the readers of this magazine through his unceasing efforts as Editor of THE BOBBIN & BEAKER.

Pat received scholastic honors in his Sophomore year, and was a member of Phi Psi, the textile school honorary fraternity, in his senior year. Pat's other activities include the Freshman and Sophomore YMCA Councils, National Textile Manufacturers Society, Executive Sergeants and THE BOBBIN & BEAKER staff. Pat's honors were climaxed in his senior year by his admission to Tiger Brotherhood, which is a local organization that stresses leadership qualities.

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Where Are They Now?

A survey was made of the Class of 1943 . . . the following graduates were located.

Name **Position & Company** **Address**

Blakeney, D. H.; Manager, Industrial Engineering Co.; Kershaw, S. C.

Cheston, B. A. (Chestochowski); Head, Textile Research, Proctor & Gamble; MA&R Bldg., Ivorydale, Cincinnati, Ohio

Christman, M. S.; Production Superintendent, Pacolet Mfg. Co., No. 4; New Holland, Ga.

Cornwell, John B., Jr.; Superintendent Mills Mill, Saxon Plant; Spartanburg, S. C.

Cranford, W. D.; Resin Finisher, Rock Hill Printing & Finishing Co.; Rock Hill, S. C.

Glenn, C. J.; Quality Control, Abbeville Mills Corporation; Abbeville, S. C.

Goudelock, G. E.; Payroll Department, Sonoco Products Company; Hartsville, S. C.

Graham, J. S.; Ass't. Professor of Textile Testing and Research; Clemson College, Clemson, S. C.,

Harris, J. B., Jr.; Vice-President, Greenwood Mills; Greenwood, S. C.

Howard, C. R.; Plant Manager, New York Mills, Div. United Merchants & Mfgrs.; New York Mills, New York

Howell, Bob; Salesman, Raw Materials & Yarns; John Stickley & Co.; Charlotte, N. C.

Liner, Robert A.; Superintendent, Greenwood Plant, Greenwood Mills; 315 Cambridge, Greenwood, S. C.

McCarthy, J. J.; Textile Department, Johns Manville; 152 Dukes Parkway, Somerville, N. J.

Miller, J. H; Major, United States Army; 8063 Mid Haven Road, Baltimore 22, Maryland

Momeier, G. H.; Plant Chemist, Gregg Div., Graniteville, S. C.; 319 W. Martintown Rd., N. Augusta, S. C.

Pitts, P. L.; Manager, Pitts Country Market; Clinton, S. C.

Reese, Charles A.; Divisional Superintendent, Rock Hill Printing & Finishing Co.; Rock Hill, S. C.

Stanley, T. E.; Branch Manager, McBee Company; Box 9148, Raleigh, N. C.

Stone, James C.; Cost Controller, Riegel Textile Corporation; Ware Shoals, S. C.

Strom, L. S.; Registered Pharmacist, Strom's Drug Store; McCormick, S. C.

Templeton, W. D.; Overseer Spinning, Springs Cotton Mills, Eureko Plant; 170 York St., Chester, S. C.

Wood, Charles R.; President, Stationers Distributing Co.; 4924 Lake Drive, Ft. Worth, Texas

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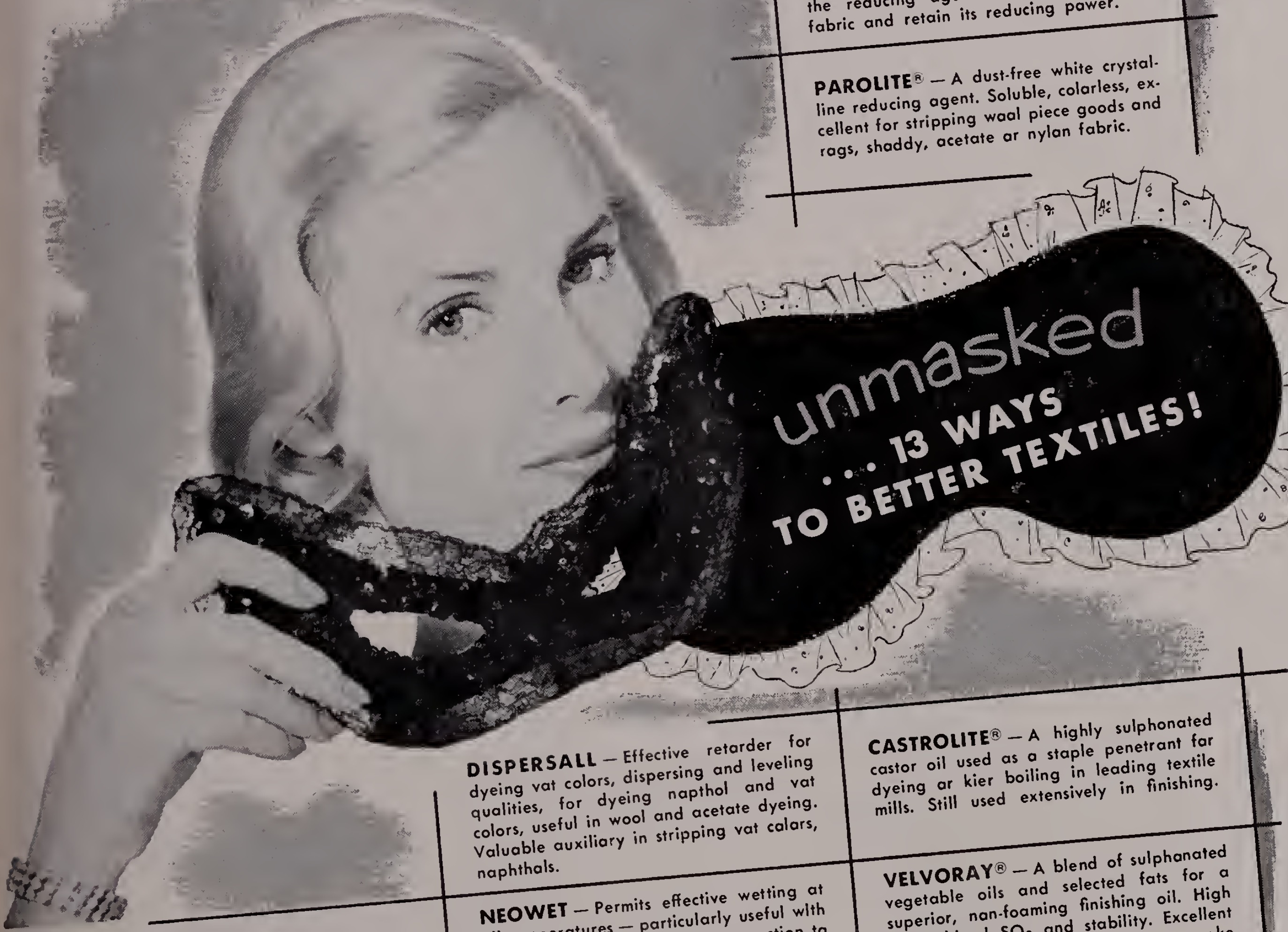

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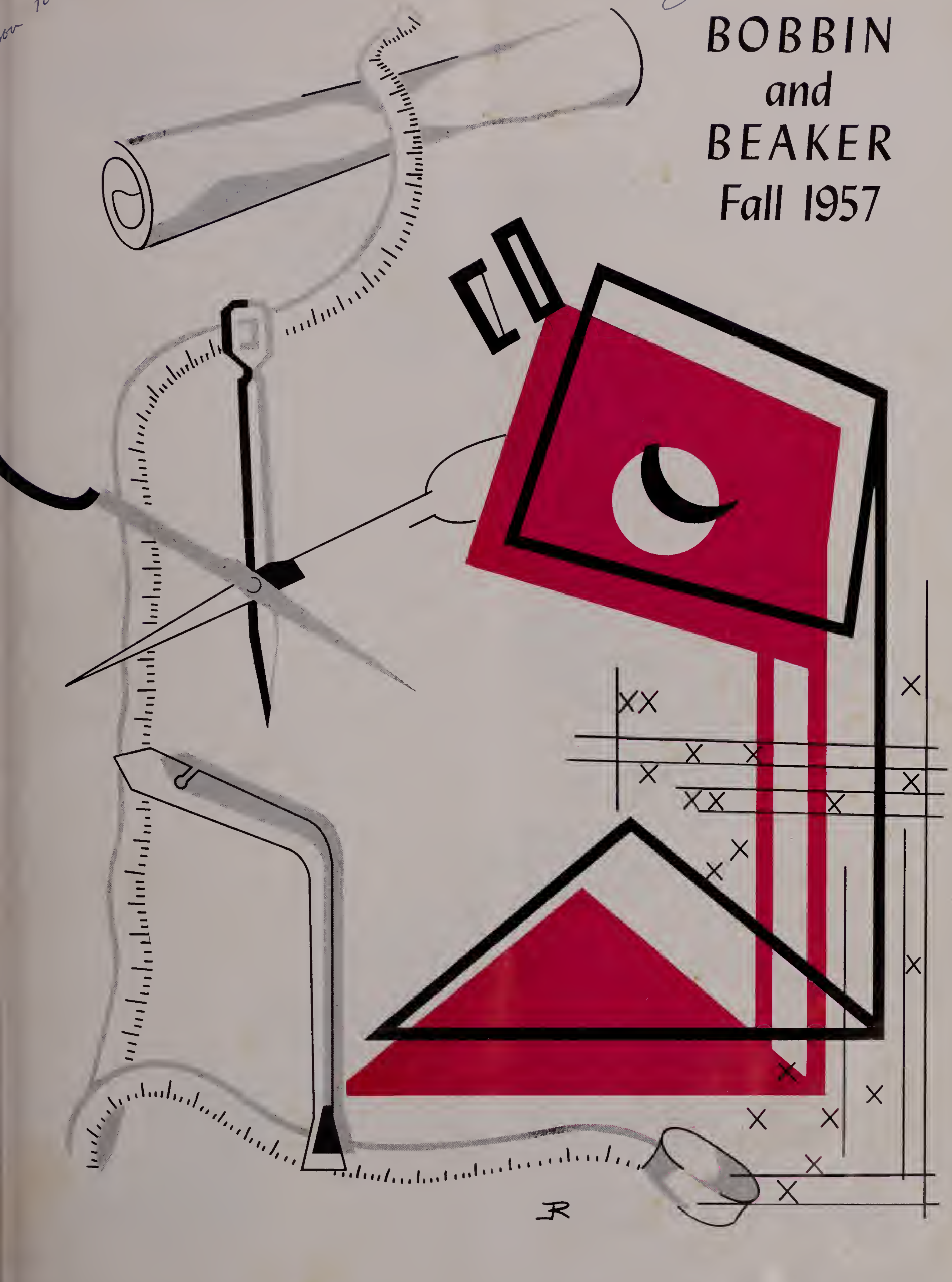
BOBBIN and BEAKER

Fall 1957



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Bobbin & Beaker

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Clemson Textile School

VOL. 16 FALL ISSUE NO. 1

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COVER: Rowena Janell Cummings.

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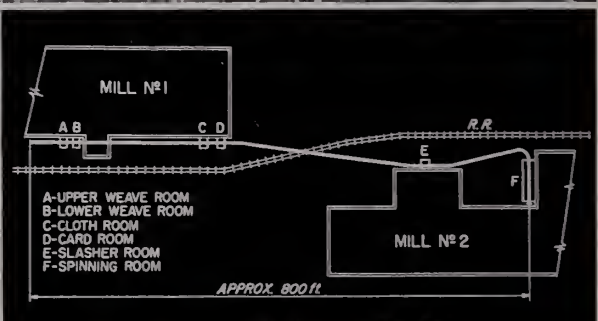

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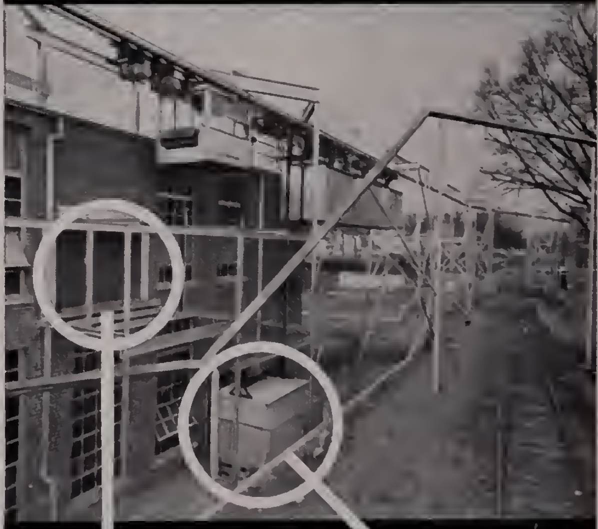

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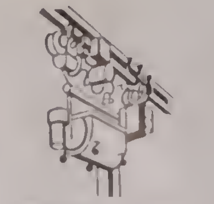

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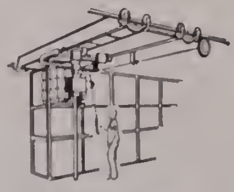

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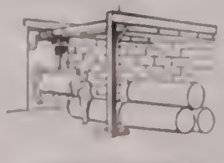

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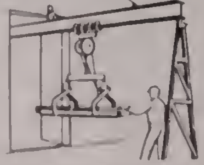

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"POUND FOOLISH"

(Reprinted from TEXTILES INDUSTRIES)

While the textile industry is bedeviled by many vexing problems, there are some positive things that can be done to help the situation. Three of the things are:

1. Marketing development
2. Inventory and cost control
3. Sensible pricing policies

All of these items are basic and are of paramount importance. Unless we develop markets we can't make sales. If we fail to control our inventories and costs we bring about a chaotic situation that will ultimately result in bankruptcy, liquidation, and more mergers. If we fail to establish a sensible pricing system, we are unfair to our stockholders, our employees, our communities, and ourselves.

While a good bit can be said about each of these three matters, I intend to concern myself principally with the third item, sensible pricing policies. As sensible men in a basic industry, we cannot fail. We must have the wisdom, the foresight, and the cooperative spirit to win a battle against overwhelming odds. We should help each other in every way possible to establish sound markets, to control our costs and inventories, and price our yarns and fabrics in a sensible manner. Now, let's see what we can do about it.

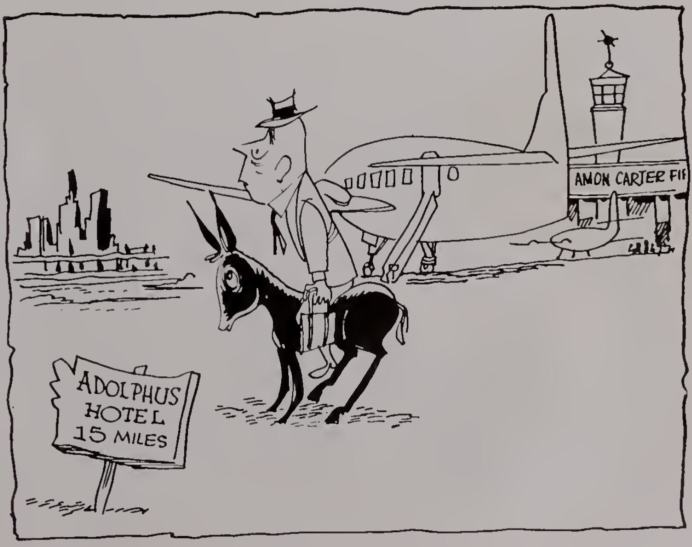
Let us assume that a prominent mill manager had an appointment to meet a good volume cutter to go over a new line of goods and place some business with the cutter for his spring line. We assume that he boards a DC-7 in Atlanta and that two hours and forty minutes later the plane is on the ground at Amon Carter Field. After the plane lands the mill manager rushes over to a nearby livery stable, mounts a burro, and three hours and a half later arrives, sweating and smelling slightly of a quadruped, at the Adolphus Hotel for his appointment.

This is a ridiculous and absurb example, I can assure you. No one would use modern plane transportation and then make the final lap of the journey on a primitive burro; however, many textile mills do things just as ridiculous. Some of theme Micronaire their cotton, maintain strict quality control within the plant, use modern and up to date machinery, and combine all of this with crude and obsolete methods of pricing and merchandising the final product. This might be a shock to a good many people in the industry, but it is absolutely true that quite a few mills, even in this atomic age, are pricing yarns and goods on an average plant poundage cost, with rule-of-thumb differentials for various yarns and fabrics. Some of them use the auction, or "What'll you gimme" method. Some of them depend on commission salesmen for establishing prices. I do not mean to imply that commission salesmen or salaried salesmen are not good, well-meaning, conscientious people. I know for a fact that most of them are. However, mill management seldom, if ever, insists and holds out for reasonable profits.

Take a look at page 16 of the **Journal of Commerce,** dated Thursday, November 1, 1956, and look at the yarn quotations. Note that 8s, 10s, and 12s carded yarns are offered at the same price for singles as for two-ply. Anyone familiar with the principles of cost accounting knows that it does cost some money to ply yarns.

Now, let's go down the list a little bit further and look at 18s carded. It is reported here that 18s two-ply carded costs one cent more than 18s singles carded. Anyone familiar with twisting costs knows that a differential of 1¢ between 18s singles and 18s two-ply is ridiculous.

Go down the page just a little bit further and look at 18s single combed and 18s two-ply combed; 18s two-ply combed is being offered at 8¢ per pound more than 18s singles combed. It doesn't cost any more to



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twist 18s two-ply combed than it does to twist 18s two-ply carded, yet in one instance we see a difference of 8¢ per pound. It admittedly costs more to twist 38s two-ply than it does 18s two-ply; however, we note a differential of 6¢ per pound for 38s two-ply combed over 38s singles combed, whereas the differential between 18s singles combed and 18s two-ply combed is shown as 8¢ per pound.

People in the yarn business, of course, admit that this is asinine and ridiculous, but what do the people do who offer fabrics for sale? They'll beat 'em to a nub on their home grounds and let 'em offer their own odds.

Recently a grey goods mill was offering for sale a number of different constructions. All of these constructions were being offered at the same poundage price. This was being done despite the fact that the average yarn counts in some of the fabrics ran in the vicinity of 8s singles, and in other fabrics ran approximately 20s singles. It is needless to say that these people were losing money. They went to one of their customers and told him that they could no longer offer him goods at the same poundage price and would have to discontinue making two numbers that they were furnishing him.

The customer went out and found a new source of supply for the two numbers that he was running with this poundage price-quotation mill. In the meantime, the mill installed a cost system which gave it a cost on each fabric made. Much to their alarm, management found that on the two numbers that they had dropped, they were actually making money. These numbers of course, happened to be coarse-yarn, low-sley, and low-pick goods.

They went to their former customer to see if they couldn't get back in the picture, but the customer had a new source of supply and saw no reason to go back to his original supplier for the goods. This mill actually lost a good account because of inadequate cost information

Recently a well known textile firm was offering for sale two constructions. Both of these were made using the same warp counts; however, in the filling one fabric had nine picks more than the other fabric, and the filling yarn was half the size in one with the higher pickage. Furthermore, the high-pick, fine-yarn filling goods weighed 1¾ ounces per square yard less than the low-pick, coarse goods.

Sound cost accounting would indicate that the cost per pound would be a good bit more for the lighter yarns, higher pickage and lighter weight material, but imagine their chagrin when they found that the lighter weight goods with more picks, with finer yarn were actually selling at slightly less per pound than the heavier goods with coarse yarns and low pickage. The matter was checked and it was found that the mill could come out on the coarse goods, but would sustain a substantial loss on fine goods. Of these fabrics, the light-weight one with the higher pickage and the finer counts in the filling was, of course, the better seller. The buyers know a bargain when they see one, and they go for it. This situation was not at all humorous to the mill's salesmen. They immediately wanted to know why the mill couldn't meet competition.

The average man managing a textile mill is a good man. In most respects he is better than an average man. He tries to do what he can to serve his customers, his employees, his stockholders, and his community. He is intelligent, well-educated, and his pride and joy is in the capital improvements that he has made in his plant facilities.

The average buyer is another good man. If you make a close check into the situation though, you will find that he is certainly no more intelligent, and for the most part is not as well educated as the mill manager. All he wants to do is to make the best buy possible for his firm.

What happens when the mill manager and the buyer get together to arrive at a price for goods? With-

REED MAKERS

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out going into all of the gory details of happenings during the negotiations, the final chapter in the play leaves the buyer stalking out looking like the cat who had just devoured the canary, with the mill manager shivering in his socks and his underwear (that is, if he is lucky).

Let's take a look at the mill manager when he makes a purchase. I wonder just how much he would pay for vat jade or sulfur black. How much would he pay for 75-denier nylon? How much would he pay for starch? How much would he pay for caustic soda? Can he negotiate a trade? I don't think that there is any doubt in the mind of anyone that Mr. Mill Manager buys dye, starch, chemicals, and numerous other items irrespective of the vendor. Check the stream of salesmen offering dyestuffs, chemicals, and starches that come by your mill. You must admit that there is competition. Compare the financial statements of the textile mills with those of the dyestuff industry, chemical industry, the automotive industry, the steel industry, or perhaps any other industry and observe the results.

A mill is a place where purchases are made on a more or less fixed-price basis, and sales are made on a basis of rumor, hysteria, panic and—the economists say in some instances on supply and demand.

Can we drive into a Gulf service station and drop a hint that Standard Oil down the street is selling for 1c per gallon less, and strike terror to the soul of the service station operator?

Can a small hole-in-the-wall jobber with $25,000 in net assets create a panic in the textile market by a few well-placed rumors?

How can men of good will engage in the vicious, cut-throat competition that is employed in the textile industry? Why do they look at each other like strange bulldogs when someone is so rash as to suggest that a price increase is in order due to advances in labor costs, cotton costs, chemical costs, etc.? An unlettered farmer with a truck load of highly perishable produce can actually price and market his products to better advantage than a mill manager with a Ph.D. degree.

A wise general evaluates the situation before he deploys his forces. Do we evaluate the situations before we make decisions? Do we actually know what we are doing? Before proceeding further, let's ask ourselves a few questions to see if we know where we stand.

Before we can compute a cost, it is necessary to have the information on hand to do the job:

Are our loom speeds up to standard?
Are our front roll speeds up to standard?
Are our efficiencies up to standard?
Do we check to see that it is within our standard?
How often do we check this?
What are our standard package weights?
Do we check to see that our package weights are up to standard?
How often do we check package weights?
Do our frames produce sliver, roving, and yarn? No, I'm not trying to be funny. Go out in the plant and count the idle deliveries and spindles and get a shock. How often do we count our idle spindles and deliveries?
What standards have we set up for them?
Are our yarns heavy?
Do our fixers always change the pick wheels when styles are changed on our looms?

A close-out is generally the result of an unsound inventory policy. Do we run our mills on bona fide orders, or on hopes of orders? Other things can cause a close-out, but in the end inventory policy, or rather lack of inventory policy, brings about a sale comomnly known as a close-out. Some close-outs stay in the market and depress it considerably for more than a season. The prevention of close-outs by inventory control would do a good bit to solve some close-out do we write "close-out" on our salesnote? When we make a close-out do we write "close-out" on each and every invoice.

Mr. Mill Manager, did a buyer ever approach you with a copy of a salesnote or an invoice from one of

W. B. Simmons Machine Company

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The textile industry in this state will need more than 5,000 college trained men in the next 10 years. Think seriously about the great opportunities open to you in the textile industry, and when you think of the textile industry, think of:

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your competitors? Sometimes the prices on these prize exhibits are so low as to cause some doubt as to whether the prize exhibit constitutes a bona fide sale for the coming season, or a close-out lot from the last season. If salesnotes and invoices are properly labeled, the prize-exhibit price negotiator would have some of his fangs drawn.

"A little knowledge is a dangerous thing." In quoting fabrics do we use reasonable differentials between fabrics? Do we give information to price negotiators that will enable them to beat us to death with our own figures?

Few mills realize how much seconds, remnants, and close-outs cost them. Do our sales records show the amount of yardage sold in each style as first quality, as second quality, as remnants, and as close-outs?

For selling costs do we include selling salaries, with applicable group insurance, social security, unemployment compensation and retirement benefits; for sales offices, commissions, trade discounts, travel, entertainment, advertising, dues and subscriptions applicable to selling, allowances for seconds, remnants, and close-outs and, in some instances, designing and sample expense?

Did mill management, in the recent flurry, pass on to customers the wage increases, increases in dyes, chemicals, metal parts, cotton, and other items? You know as well as I what happened. They ran to the telephone just as fast as they could and let large pet customers cover at the old prices for a period of from four to six months. If management is not going to take advantage of a strong market, just what will it take to make management insist on a fair and adequate mark-up on each and every yarn or fabric?

Is there any reason why we can't determine what our goods cost us and add a legitimate profit? Are we slaves to an antiquated method of pricing fabrics? Do we have an adequate and up-to-date system for computing costs?

Do we make a reconciliation for each department or cost center, as well as for our entire operation?

Do we figure individual costs for each fabric that we manufacture?

In pricing yarns and fabrics, do we make each item stand on its own record?

When we price goods for less than 6% on our investment are we being fair to our stockholders?

Why should we wear out our machinery for less than a nominal return?

Does our equipment need the exercise?

What type of pricing policy do we have?

Do we price the fabrics ourselves?

Does the person assigned to price the fabrics have a financial interest in the mill? Or are our fabrics priced by salesmen? Are they priced by commission agents?

It is all right to say "We meet the market." The

(Continued on page 13)

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Dan River Celebrates 75th Anniversary

William J. Erwin, President
Dan River Mills, Incorporated
Danville, Virginia

During 1957, Dan River Mills is celebrating the 75th anniversary of the founding of the company in Danville, Virginia, in 1882. The ceremonies commemorating this historic year have not emphasized that there is great virtue in age; rather, they have stressed that past is merely prologue for a big and challenging future. This is as it should be, for what lies ahead for our company and our industry will almost surely over-shadow anything that has come before.

Dan River Mills was chartered at a time when Danville was struggling to extricate itself from the destruction caused by war and its unfortunate aftermath, Reconstruction. It was founded by men who confessed they had "limited means, no trade, and no experience in the business by any of its promoters." Its beginnings were humble, but it prospered mightily.

The first plant, completed in 1883, had 100 looms and 2,240 spindles and employed less than 100. From this tiny beginning emerged the Dan River Mills of today, a corporation whose products are known across the nation and in all the free countries of the world.

Progress has not always been steady for, in over three-quarters of a century, there have been periods of discouragement, times when the future looked dark, as the company struggled to overcome the problems stemming from cyclical fluctuations of business and the intense competition typical of our industry. Always the difficulties were overcome. The company expanded and gathered strength so that by 1956 its plants in Danville had become one of the world's largest textile operations, employing more than 10,500 persons and having almost 9,000 looms and over 450,000 spindles.

In August, 1956, in a major expansion to develop a more highly diversified product line, Dan River acquired two textile companies whose production differed from and therefore complemented the fabrics being manufactured in Danville.

One of these companies was Woodside Mills in South Carolina, whose seven plants manuafcture print cloth and synthetic fabrics. The other was Alabama Mills with seven plants in Alabama and one in Georgia, producers of corduroys, denims, gabardines, and industrial fabrics. In addition, Dan River, acquired at the same time Iselin-Jefferson Company, Inc., prominent and long-established textile selling agency, along with its factoring subsidiary, Iselin-Jefferson Financial Company, Inc.

With this expansion, Dan River is provided with far greater flexibility in meeting shifts in consumer demands and an increased ability to utilize its equipment more effectively, now at an all-time high with more than 18,000 looms and 840,00 spindles. Employment is up to almost 18,000.

According to **Fortune Magazine's** recent annual survey of the 500 largest industrial companies in the United States, Dan River in 1956 ranked 207th on the basis of assets, 289th on the basis of sales. For 1957, with the sales of the newly-acquired companies reflected in total volume for the full year, our ranking on the basis of sales will probably step up considerably.

These facts — Dan River's recent expansion and its high ranking in American industry — have a special significance to those aspiring to a career in the textile industry. At this point in its long history, Dan River requires more college trained personnel—young men and women such as yourselves—than at any time in its past. And Dan River is not alone. While I hesitate to name our competitors, it is certainly the fact that other companies in our industry are expanding and are also searching for personnel with potential for management responsibility. When you consider this, you begin to realize that the vista of the future opens up wide.

According to a recent survey, textile companies in South Carolina will need over 4,000 college men in the next ten years. This figure exceeds the entire production of all the nation's textile schools in the same period. The textile industry in South Carolina is not especially different from that in North Carolina, Georgia, Alabama, and other textile producing states, with respect to the need for college trained personnel. The requirement, as you see, is great and where the requirement is large, opportunity usually beckons. It certainly beckons in the textile industry.

Our national economy is expanding and changing at unprecedented speed. The complexities of manufacture and distribution are increasing. Industry's greatest need is for managers with perspective, im-

(Continued on page 12)

DAN RIVER CELEBRATES 75th ANNIVERSARY

(Continued from page 11)

agination, daring, and judgment, managers capable of hard decisions. This is no less true in textiles than in other major sectors of the economy. This too should have special significance for you.

Our industry, despite what you may hear to the contrary, is changing rapidly. Twenty-five years ago, synthetics were in their infancy. Dacron, Orlon, Acrilan, and other such fibers were unknown. Twenty-five years ago, wash and wear finishes for cottons were but a dream for the future. Twenty-five years ago, non-woven fabrics were unknown. The development of new products has been accompanied by the development of new technology. Rest assured that our industry has been changing rapidly, and that the pace is likely to quicken in the future.

Change brings with it difficult and challenging problems. The rewards for those who attack and solve such problems in our industry can be great. I sincerely hope you will be in the vanguard of those who will share in these rewards in the future.

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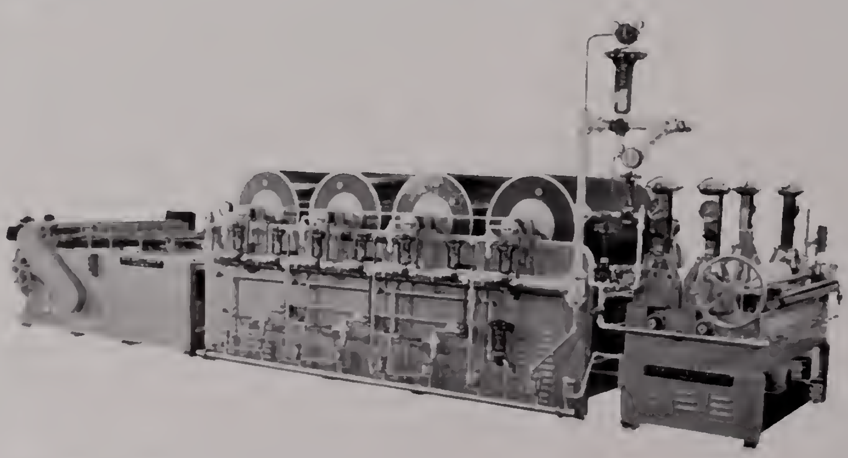

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(Continued from page 9)

problem is can we afford to meet the market?

In order to price goods intelligently, it is necessary that we first have a sound system of cost accounting. Our own accounting staff might be able to do the job. Even if they do a good job in determining our cost, do we actually know how we stack up with our competitors? A good cost consulting firm for a fee will be glad to let you know how you stack up with your competitors. Of course, the consultants do not name your competitors, but they can at least tell you what is par for the course.

Let us suppose that we have a jam-up standard cost system adjusted in accordance with a reconciliation made between standard and actual costs. Let us further assume that we have net assets of $10,000,000 in a plant with 1200 looms. To simplify the situation, we will assume that all looms are the same type.

If we are to return to our stockholders 6% on net assets in a year, then we should pay them not less than $600,000. In order to pay the stockholders $600,000, we must assume that 52% of our profit before taxes will go to the Federal Government, 2% of our profit before taxes will go to the State Government and for the sake of example only, consider that we want to put 6% in our surplus. That means that we would have 40% of the profit before taxes left to go to the stockholders,

Dividing this 40% into the $600.000 that we want to pay the stockholders as a bare minimum, we find that we would have to earn $1,500,000 before taxes. This would be distributed as follows: $780,000 to the Federal Government, $30,000 to the State, $90,000 to surplus, and $600,000 to stockholders.

Dividing our $1,500,000 by 1200, our number of looms, we find that we will have to earn $1,250 per loom per year before taxes. If we consider our manufacturing year at 50 weeks, we would divide the $1,250 per loom by 50 to give us a minimum of $25 per week that we would have to earn in order to pay our stockholders a fair return. On a two-shift operation we would have to earn $12.50 per loom per shift, and on a three-shift operation we would have to earn $8.33 per loom per shift.

The hard goods industries have launched an all-out effort to get more and more of the consumer's dollar. Heavy expenditures are allocated for consumer research and market development. Despite the fact that the population is increasing, the market for textile products seems to be diminishing rather than expanding. The textile industry needs men with energy, foresight, and determination to develop new markets and get more of the consumer's dollar. Large segments of the industry have resisted these needed changes to such an extent that the industry actually has a bad name in the eyes of young potential employees.

Capital improvements are wonderful things. If a mill doesn't spend its depreciation figure plus perhaps a little more for improvements, it is equivalent to eating out of the pantry. If we eat out of the pantry long enough the cupboard will soon be bare. All of us agree that this is good business, but do we consider first things first? What happens when the sales department asks for $15,000 for consumer research and market development? What happens when the accounting department asks for $15,000 additional budget expenditure for modernizing the cost system and setting up controlled inventories? What happens when manufacturing asks for $300,000 to buy some new machinery?

The chances are that the $30,000 requested by sales and accounting would yield far more than the $300,000 requested by manufacturing. Most likely, however, manufacturing would be granted the $300,000 before sales and accounting could get the $30,000 they wanted. In a good many instances aren't we letting the tail wag the dog?

Imports are definitely disturbing our domestic market, and it might be well to inject this matter into our catalog of textile troubles. Since Honduras imports no bananas, Brazil no coffee, Germany no harmonicas, Spain no olives, Norway no sardines, Rus-

(Continued on page 28)

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Causes and Detection of Damage in Raw Cotton

Dr. A. N. J. Heyn
Professor of Natural and Synthetic Fibers
School of Textiles, Clemson College, S. C.

In one of the previous articles of this series, the microbial damage caused in raw cotton by fungi or molds has been discussed. The present article deals with a study of the bacteria present on raw cotton and the degradation of the fiber which may be caused by these organisms. The article reports on original investigations recently carried out by the author. The results have been published in greater detail in the August issue of the Textile Research Journal.

INTRODUCTION

The study of microorganisms active in the deterioration of raw cotton has been mainly concerned until the present time with fungi. The present article is a short account of an investigation carried out by the author during the last two years with field cotton from Clemson and other locations in South Carolina and Georgia. It deals with bacteriological observations on field cotton and the role which bacteria may play in the degradation of the cotton fiber.

It is a well known fact that a number of species of bacteria are able to decompose cellulose. These bacteria have been, so far, only isolated from soil and were found to play an important part in the decomposition of plant wastes.

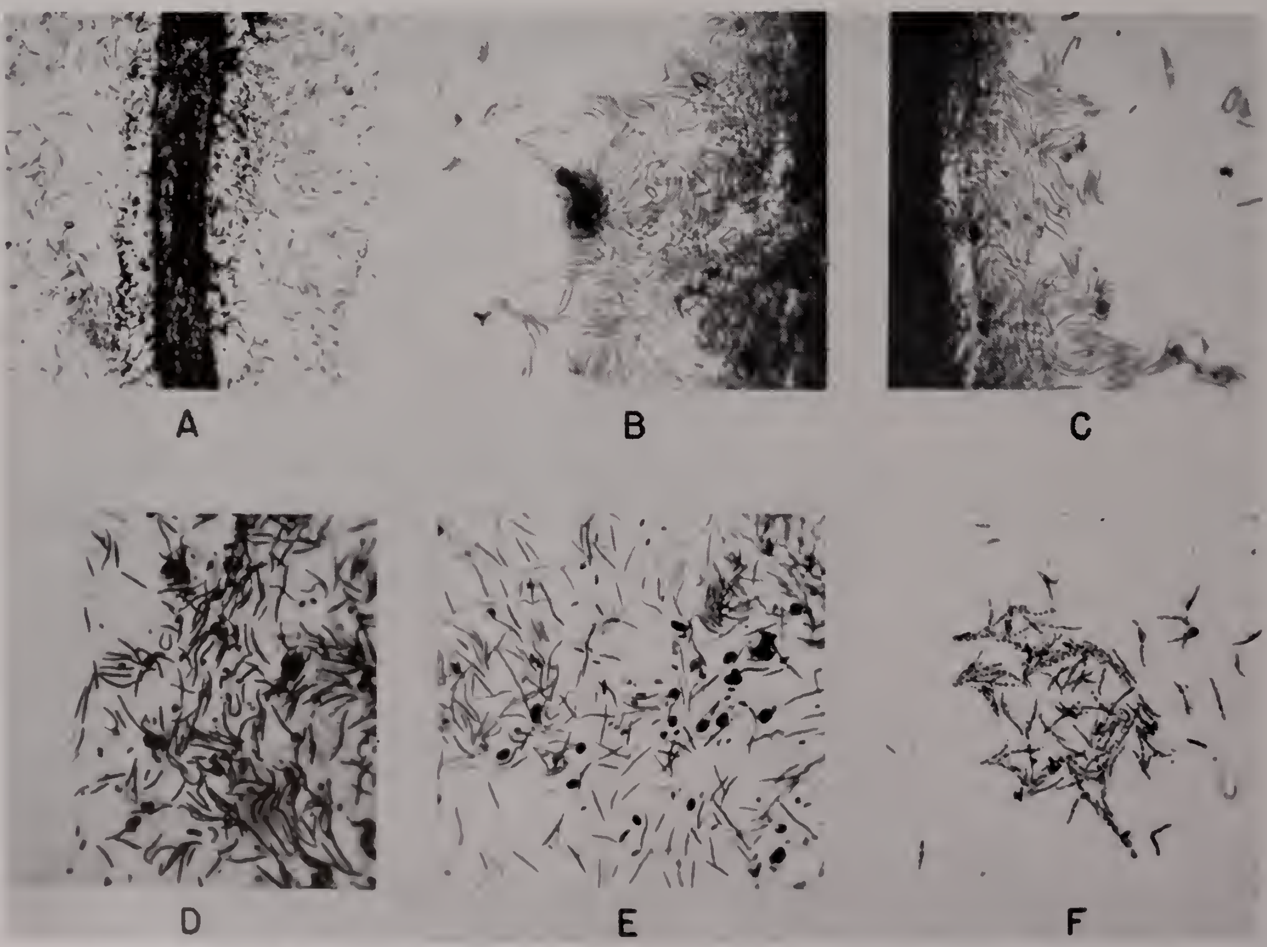


Figure 1. Vegetative cells and microcysts of cellulose bacteria a, b, c, Sporocytophaga ellipsospora, a, fiber in final stage of decomposition with conglomerations of spore on both sides. Magnification, 520 X; b and c same bacteria, magnification 1040 X; typical arrangement and conglomerations of micrcysts in b.

d, e, and f. Sporocytophaga myxococcoides. d, e, vegetative cells and microcysts; concentrations of chromatin are seen inside the bacteria in f.

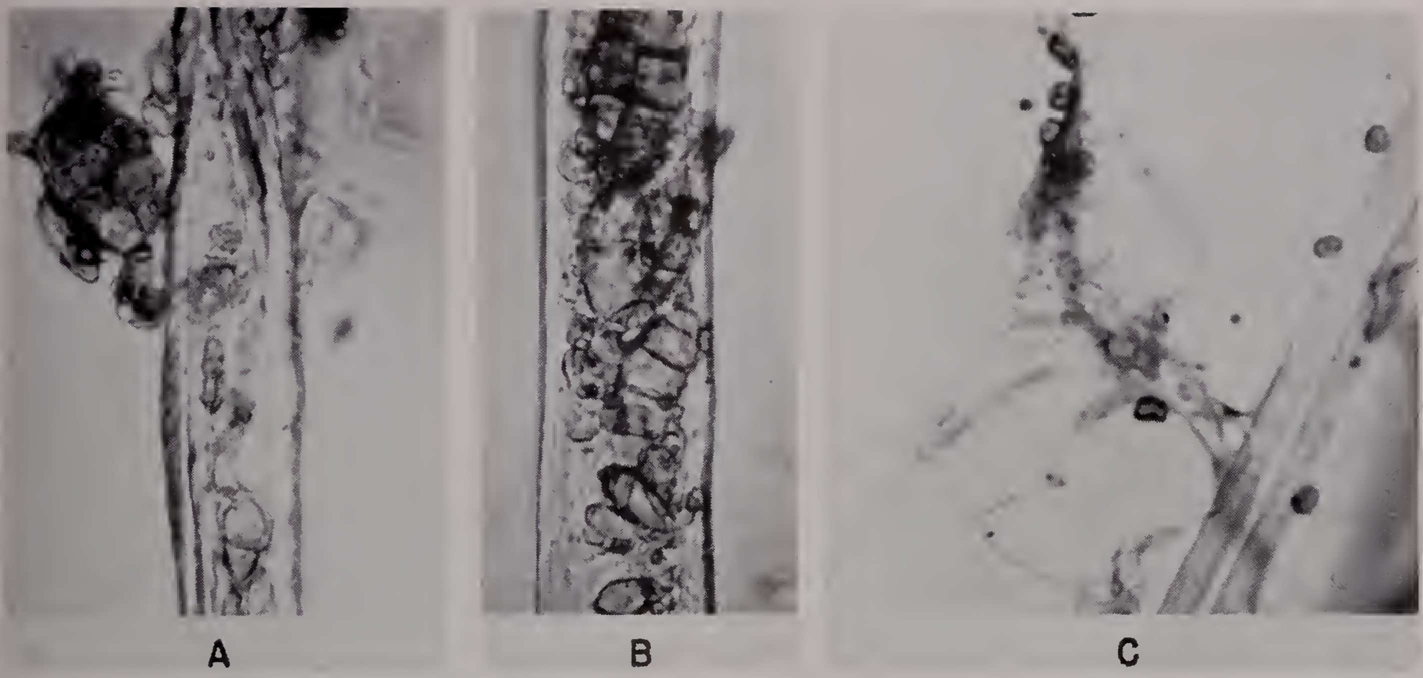


Figure 2. Fruiting bodies of Myxobacteria on cotton fiber. a, and b. Memphis, Tenn., sample with brownish spots. Fruiting bodies probably of Polyangium cellulosum. The larger, composite fruiting bodies faintly resemble conidia of Alternaria. Cotton fiber highly, locally swollen, about 300 X.
c. Clemson field cotton which developed yellow spots at high humidity in the laboratory. Note protoplasm like strands of conglomerations of bacteria, typical for myxobacteria, and scattered fruiting bodies. 875 X.

The only work carried out concerning the role of bacteria in the decomposition of textile materials has been concerned with weathered cotton fabrics. In the Quartermaster research program of the deterioration of cotton fabrics, for instance, various bacteria were isolated, but none of the spore-forming species was found to possess the ability to decompose cellulose. Various investigators have assumed, however, the presence of cellulose decomposing bacteria on such fabrics.

With regard to **raw** cotton, the role of bacteria is even more of a question. The number of bacteria per gram of raw cotton has been determined and found to vary from 220,000, to 520,000,000 bacteria per gram of ginned cotton; 1 to 100 million bacteria per gram of cotton would be the average degree of contamination to be expected in a good grade of raw American cotton. These bacteria have not been identified, however, and nothing is known about their role of importance in fiber degradation.

The only bacteria isolated from baled cotton which have been identified so far, is Aerobacter cloacae. This bacteria is not able to decompose cellulose, and is only of importance from the medical standpoint since it may cause certain diseases of the respiratory tract.

In conclusion it can be stated that the role of cellulose bacteria in the degradation of raw cotton has often been assumed, but no actual research data have been reported at all.

METHOD

In the present study, the bacteria were isolated from field cotton by placing the cotton locks for a very short period of time on pure sterile filter paper, soaked in an inorganic salt solution. Since the only organic material present in this substrate is cellulose, this method would be suitable for isolating cellulose decomposing organisms from the cotton. Colonies which developed were investigated and the degradation of the filter paper was observed. A special staining technique was used for observing the bacteria under the microscope.

CELLULOSE DECOMPOSING BACTERIA ISOLATED FROM FIELD COTTON

With the above medium, various bacteria were isolated from field cotton. After some time, the filter paper became soft and transparent, and was totally dissolved, so that large holes were formed at the place of the colonies. The colonies were generally colored; mostly brown, pink, yellow, or reddish.

The bacteria isolated were all found to belong to the **Myxobacteria.** This is a very remarkable order of bacteria of which certain representatives are known to be able to decompose cellulose. Bacteria of this group, form typical resistant fruiting bodies which consist of large conglomerations of shortened bacterial rods surrounded by membranes. Five species were obtained from the field cottons investigated.

For a full description of the species in question, the reader is referred to the original, more detailed pub-

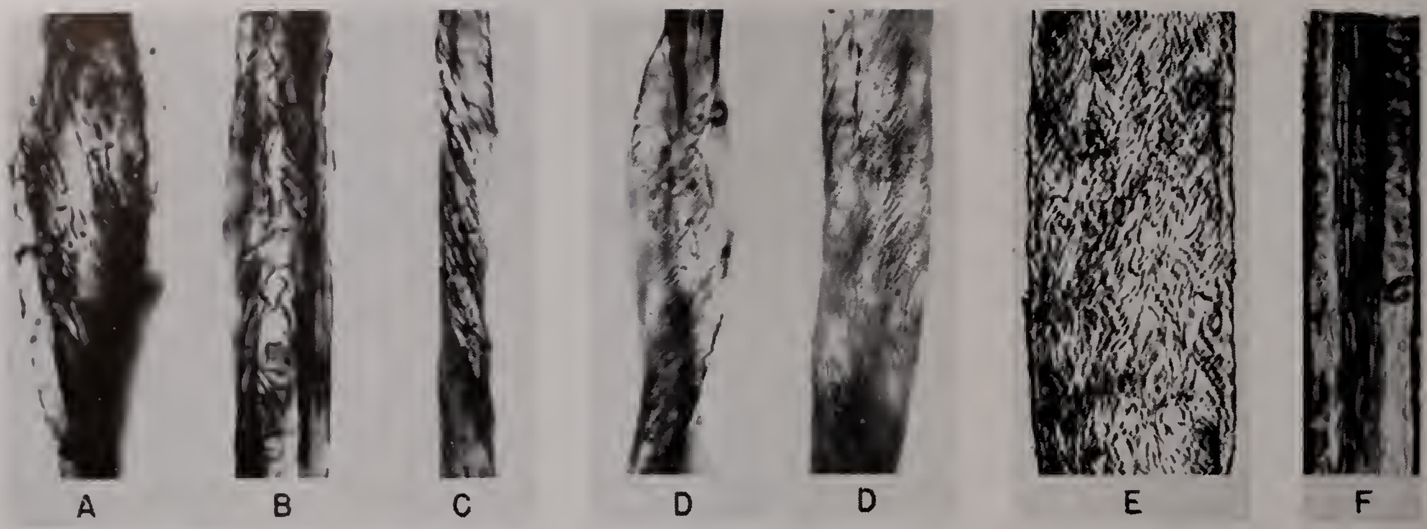


Figure 3. Different stages of development of sporocytophaga myxococcoides on cotton fiber. a, b, c, Initial stages; d, bacteria on surface of fiber; e, Final stage; fiber completely filled with bacteria, little cellulose being left. Note spiral orientation of bacteria parallel to spiral structure of fiber; f, Same bacteria on flax. Note orientation parallel to the longitudinal axis of fiber, Winogradsky staining; magnification1040 X.

lication. Figure 1 shows some of these bacteria at high magnification. Figure 2 shows fruiting bodies in cotton fiber.

DECOMPOSITION OF THE COTTON FIBER BY THESE BACTERIA

A special study was made of the disintegration of raw cotton fiber by these bacteria. For this purpose, sterile cotton fibers were inoculated with the pure cultures, isolated from field cotton in Clemson. At subsequent intervals, samples of the fiber were investigated for the presence and development of bacteria and the degradation of the fiber was determined. Figure No. 3 illustrates the growth of bacteria on the fiber and figure 4, the subsequent disintegration of the fiber. The bacteria are arranged along the spiral structure of the fiber and develop very rapidly. In the final stage, the complete cotton era is transformed in a spiral like arrangement of bacteria as shown in photomicrograph No. 3, e.

DIRECT OBSERVATION OF BACTERIA ON COTTON FIBER

If raw cotton fibers are treated with the proper bacteriological stains, bacteria in larger or smaller number can always be found (figure 5). Especially in discolored cotton of yellow, pink, tan, or brown color, many bacteria were observed and in certain instances, some of these bacteria could be identified from their fruiting bodies, and were found to be identical with the above cellulose decomposing species. Many non-cellulose decomposing species will also be present.

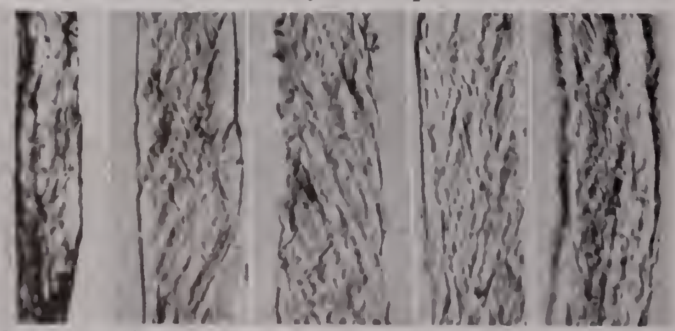


Figure 4. Cotton fibers attacked by cellulose bacteria in water. The bacteria are immersed between the fibrils and are not easily seen. Magnification about 560 X.

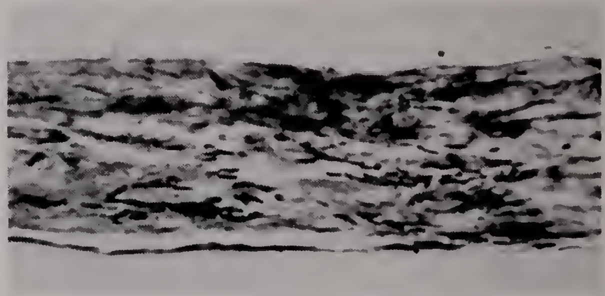


Figure 5. Bacteria on field cotton

CONCLUSION

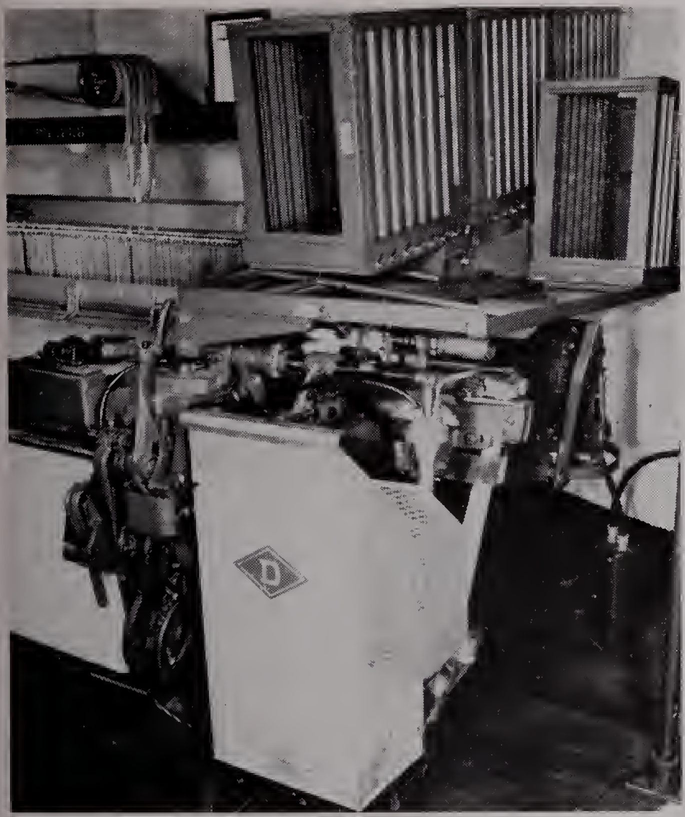
From the above observations it may be concluded that cellulose decomposing bacteria do not only **occur** on field and baled cotton, but may also cause **disintegration of the fiber.** Some authors have assumed this without further investigation. The present results have not only ascertained this assumption, but the bacteria that may be involved are also identified for the first time.

The importance of these findings for the cotton manufacturer will be clear. In cases where fungi cannot be detected as a cause of the degradation, one should count with the activity of bacteria which can grow inside the fiber and which at great dryness can form their typical resistant fruiting bodies which allows them to become active again at any moment that a favorable degree of humidity returns. The special bacteriological staining techniques could be used on the side of the stains used for detecting fungi, for checking the broken ends during the spinning of yarns from suspected cottons.

The Draper Automatic Filling Magazine

(Prepared by the Research and Advertising Department of the Draper Corporation)

For many years textile machine engineers have sought a practical method of supplying bobbins to looms automatically, thereby eliminating the tedious and costly job of "plugging the bobbins" by hand. The Draper Corporation has pioneered in this line of research and in recent years has developed an Automatic Filling Magazine which promises to accomplish this end. At the present time there are several small installations of the Automatic Filling Magazine undergoing extensive mill tests under a variety of actual operating conditions.



The magazine track is built to accommodate two full magazines when the loom is started up; a third may be added when the first magazine is half empty. The capacity of each magazine is 96 - 1 1/4" package diameter bobbins, or 80 - 1 7/16" bobbins, equally distributed in eight vertical compartments. A filling hauler with a hand truck designed to carry a quantity of loaded magazines eliminates the battery hands required by present rotary battery-loading methods. The filling hauler's sole function will be to transfer full magazines from his truck to the feed track, and remove empty magazines from the return track.

Special bobbins with a 3/4" plain tip are needed in order to accommodate a tip bunch. The bobbins are prepared and loaded automatically into the magazine by a standard quiller adapted for this purpose. This operation is carried out in the yarn preparation room, after which the magazines are delivered by truck direct to the weave room.

Manufacturers of automatic bobbin winding machinery are working to adapt existing winders to prepare the tip bunch and automatically load the loom magazine. Also, development work is now progressing to prepare direct spun loom bobbins for use in this device.

The magazine track is tilted slightly, and the magazine moves forward by gravity and vibration. It progresses and empties one vertical compartment at a time by means of an indexing device controlled by the presence or absence of bobbin supply. When a magazine is empty, it is released automatically, shifted to the return track, and a loaded magazine slides down into feed position.

At the transfer a pneumatically-operated rod with a split spring collar pulls off the bobbin tip bunch,

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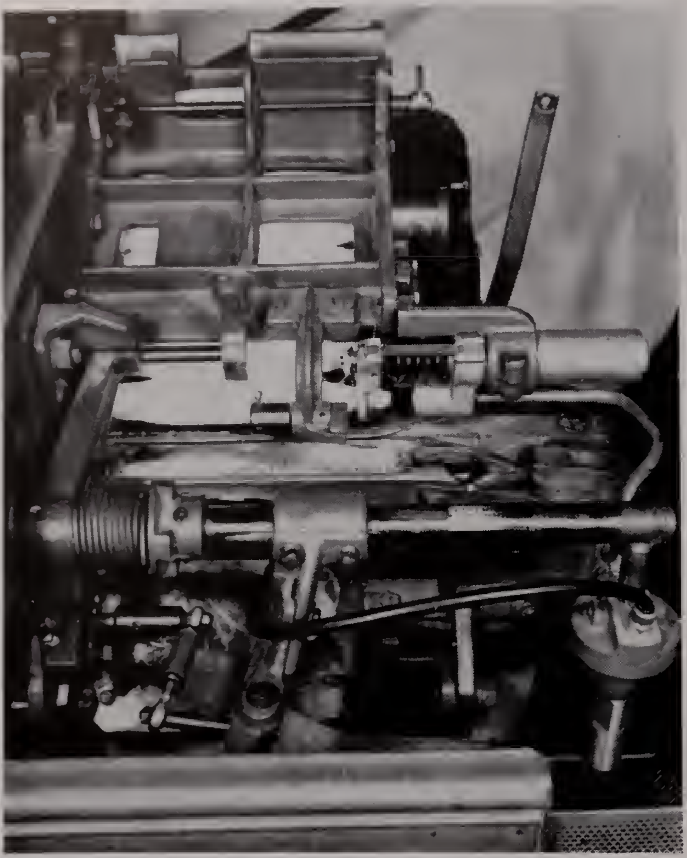

and a vacuum, created by a Venturi tube, is utilized simultaneously to hold and clear the filling ends from ingoing and outgoing bobbins. A mechanical timer, actuated by the bobbin transfer system, controls accurately the period of airflow in order to minimize air waste. The airflow remains on only during the transfer and while the temple is cutting the ends of ingoing and outgoing bobbins at the selvage.

To sum up the foregoing, the entire sequence of moves and operations after the full magazine has been placed in the feed track is completely automatic.

Development work on the Automatic Filling Magazine is progressing steadily in the light of results of the mill tests. When the magazine is finally released to the trade, the Draper Corporation believes it will offer the following positive advantages:

1. It will eliminate completely the conventional rotary type battery
2. It will greatly reduce labor costs
3. It will yield cleaner yarns and fewer cloth seconds as a result of less handling by mill hands.
4. The pneumatic thread clearer will remove loose filling ends automatically
5. The thread clearer will reduce drag-ins and other imperfections caused by filling waste being drawn into the weave.

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☆

Outstanding Textile Seniors

By Wayne Freed, TE '59

Louis T. Runge, from Greenville, S. C., is a Textile Manufacturing major. Louis, who spent four years in the Air Force, is married and now resides here in Clemson. He has been outstanding scholastically in that he has received honors in his school work during each of the three and a half semesters and two summer schools that he has attended. Outstanding among Louis' campus activities is the fact that he was President of Phi Psi Fraternity in his Junior year. He is also a member of the Clemson Chapter of the Society for the Advancement of Management. Louis has plans to enter the production phase of the textile industry upon graduation.

Richard K. Hall, better known as "Dick" around the Textile School, is a Textile Manufacturing major from Greenwood, S. C. Dick has gotten that much-needed experience in the textile industry from his four years work at the Matthews Plant in Greenwood and two summers of work in the Utica-Mohawk plant here at Clemson. This experience will be of great value to Dick as he enters the production phase of the industry, as well as helping to put himself through school. An impressive fact about Dick is that he was the recipient of two scholarships: the Keever Starch Company Scholarship in his Sophomore year and the American Enka Company Scholarship in his Junior year. He has also been a member of Phi Psi and the National Textile Manufacturers Society for the past two years. Dick, who is married, lives with his wife and son in Pendleton.

William Austin Rush, is a Textile Manufacturing major from Greenwood, S. C. Bill, as he is better known around the campus, lives with his wife and son in Clemson while attending school. Bill's list of honors includes scholastic honors 2nd semester of the '55-'56 year, summer of '55 and summer of '57. As a member of Phi Psi his Junior and Senior years, Bill was elected Senior Warden this year. He is also a member of the National Textile Manufacturing Society and the Veterans Club. Bill has done summer work in the textile industry and was recently employed by the J. P. Stevens Company to help with part of his school expenses. Using this experience, Bill plans to enter the production phase of textiles.

Changes in Density of Cotton Fibers During Progressive Stages of Maturity

by
Charles V. Wray, Associate Professor of Textiles
School of Textiles, Clemson Agricultural College
Clemson, South Carolina

Introduction

The report that follows constitutes a derivative finding that resulted from a study initiated in an attempt to formulate a rapid and economical procedure for determining fiber density. The original study was prompted by a desire to improve upon fibre density determination methods which have been practiced and are quite time consuming as well as requiring an abundant amount of apparatus.

To cannon a few of these methods: Floating [2], Picnometric [3], Bone Dry State [4], In Water [5], and Helium Gas [6].

Under "Preliminary Experimentation" and "Materials and Methods" sections that follow will be found the various steps that lead to the true purpose of this report. Neither absolute correctness of density findings nor a new and improved method of density determination is hereby claimed as a result of the study. Rather than these, the purpose is to show the change in density of cotton fibres during progressive stages of maturity.

As experimental work progressed it became apparent that the seven varieties of cotton being used, each at four stages of maturity, gave somewhat similar graphic results and especially in the change in density from 30 days to 35 days after flowering. Also, as will be shown, density-maturity curves of the seven varieties grouped themselves into four rather distinct patterns as far as similarity was concerned.

Preliminary Experimentation

(1) The study was begun with the idea of using Archimedes' principle [6] to find fiber density. This, of course, requiring the use of the basic formula

$$\frac{W - W_1}{W} = \frac{d_1}{d}$$

with W = weight of body in air
W_1 = weight of body in liquid
d_1 = density of the liquid
d = density of the body

This led to the necessity of finding the best wetting agent for the sample and also one that would not cause air bubbles either to cling to or be present within the fibers. Extensive tests were run with Charlab 154[1], Dreft[2] and Victawet 35B No. E 5651[3]. 45 cc of Charlab 154 to 400 cc water proved to be the best mixture to use. With both Dreft and Victawet 10 grams to 400 cc water gave best results.

The 3 above agents were eventually discarded because of various reasons. Those being: Wetting not accomplished properly, variation in sample density for long periods of time, some fibers separating themselves from the sample and because of air bubbles clinging to the samples. In addition to regular cotton, purified cotton was used with these agents and this too gave undesirable results.

(2) Methyl alcohol was next tested as an agent. It was tried: (a) alone (b) following a Victawet treatment (c) followed by distilled water treatment and (d) on purified cotton in addition to non-purified. This agent proved unreliable because of a great deal of weight, thus density, change of the sample over long periods and that change being quite erratic. It was discarded because of poor results in a majority of the great number of tests run.

(3) Following the tests with methyl alcohol quite a variety of tests were made with sec. butyl carbinol[4] to determine if it would be a suitable agent.

(a) The first of these tests was to see to what extent this alcohol affected the density of cotton samples and the time lengths involved in a change if such materialized. Unlike methyl alcohol the sec. butyl carbinol did not change sample density over long periods of time. Rather, what change did occur was later reversed with the density of most all samples returning in approximately 2 hours to the same density found shortly after submerging them in this alcohol. Weighings were taken every 10

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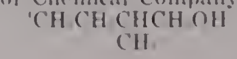

$CH_3CH_2\underset{CH_3}{CH}CH_2OH$

minutes while the samples were submerged. Other samples were left in the alcohol over night and still another group left 18 hours—weighed and found to retain the original density. During these tests a Mohr's balance was used to check often the sec. butyl carbinol density.

(b) Small samples of cotton were dropped on the surface of sec. butyl carbinol 2 inches deep in a beaker. These samples all took very close to 3 seconds to sink and rest on the bottom. There were no signs of air bubbles on the outer surface of these samples.

(c) The next series of tests was to check further for air bubbles on and also in the samples. Results were that samples lowered slowly into the sec. butyl carbinol did not have air bubbles clinging to the outer surface of the fibers. Some sixty odd different samples were allowed to remain in the alcohol for a 2 hour period. These samples, each composed of some 200 to 300 fibres, were then examined under a microscope. In most instances the fibres were free of internal air bubbles or pockets. In cases where there were air pockets these were confined to only 1, 2 or 3 of the total 200 to 300 fibres being examined. These few air pockets ranged in size from almost the width of the fiber down to a very, very small fraction thereof. As to length—the pockets were apparently 1/40 to 1/100 the total fiber length.

(d) Tests were run as to the effect of change of temperature on the sec. butyl carbinol density. The results are shown in Table I.

Table I. Effect of Change of Temperature on sec. Butyl carbinol Density

Temp. (°C)	Density
22.0	.8190
22.6	.8176
25.2	.8140
27.5	.8130

(e) Next, it was decided to see to what extent sec. butyl carbinol would evaporate when allowed to stand open in a container in the testing laboratory. For this test 50 cc of the alcohol was used. The results are given in Table II.

Table II. Evaporation of sec. Butyl carbinol

Hours after placed in open container	cc Remaining	Total Evaporation Loss in cc	Total Percent Loss From original 50 cc
0	50.0	—	—
23	49.8	0.2	0.4%
48	49.1	0.9	1.8%
121	49.0	1.0	2.0%
143	48.8	1.2	2.4%

(f) A sec. butyl carbinol solution that had been used to wet several small samples was also used to wet a 3.5 gram sample of cotton. The larger

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sample was allowed to remain in the solution for 2 hours duration—the same length of time as the smaller samples. The sample was then removed and the solution was poured onto a water glass and this placed over a steam bath. When the sec. butyl carbinol had evaporated the only residue that could be observed was very, very few quite short wire-like fibers. It was felt that such fibers were from the 3.5 gram sample which was in a fluffy loose state. This decision was reached because not any isolated fibers had been observed during the many tests where small samples, held by a fine wire, had been suspended in breakers of sec. butyl carbinol.

(g) In order to increase the number of tests in sec. butyl carbinol per unit of time 5 samples at a time were placed in a 400 cc beaker of the alcohol for the established two-hour preparatory stay. This preceded transferring the samples one at a time from the 400 cc bath to a smaller beaker for weighing in the alcohol on a chainamatic balance. In order to determine the feasibility of transferring samples from one container of the alcohol to another, several tests were run. The procedure followed in the tests was to let samples remain in a small beaker of the alcohol for two hours and then weigh the samples while still submerged in this first bath. The samples were then transferred into a second beaker of the alcohol—allowed to remain two hours and weighed. After this weighing the samples were transferred to a third beaker and allowed to remain two hours submerged. The weighings at the end of the two hour period in the first, second and third beakers were the same for any one sample to the .0001 of a gram. It was established through further experimentation that a sample returned to the same weight, as was found at the end of two hours in the first beaker, after eight minutes time in the second beaker and also after only eight minutes in the third bath. There were no bubbles clinging to samples after these transfers.

(h) Density was determined of several samples of each of two varieties of cotton by use of the sec. butyl carbinol. Additional samples of the same varieties were run through the Shirley Analyser twice thus removing the foreign matter. After the Shirley Analyser runs the density of the samples was again checked. With one variety the density had been reduced by an average of 3.93% and with the other an average of 1.73%.

(i) Several cotton samples were run through the Shirley Analyser twice and then allowed to remain in a sec. butyl carbinol bath for two hours. These samples were then examined under the microscope for the presence of air bubbles or air pockets. There were none.

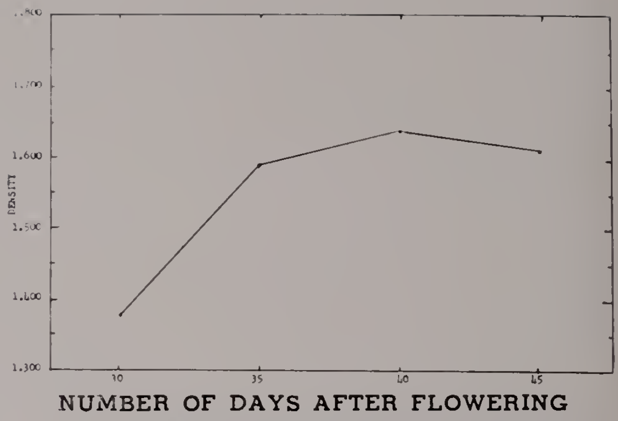


Fig. 1. Coker 100 Wilt — Change in density with progressive stages of maturity.

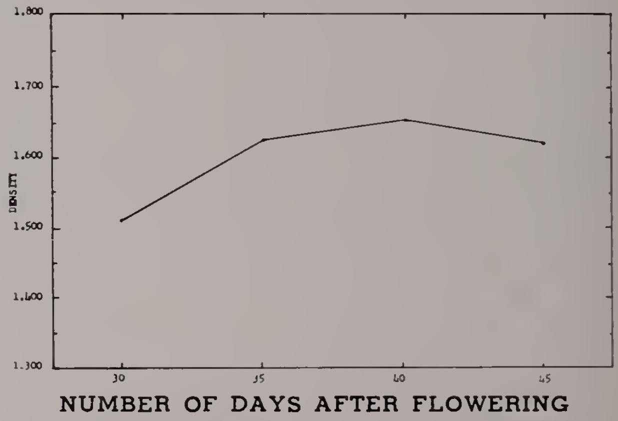


Fig. 2. Rowden 41-B — Change in density with progressive stages of maturity.

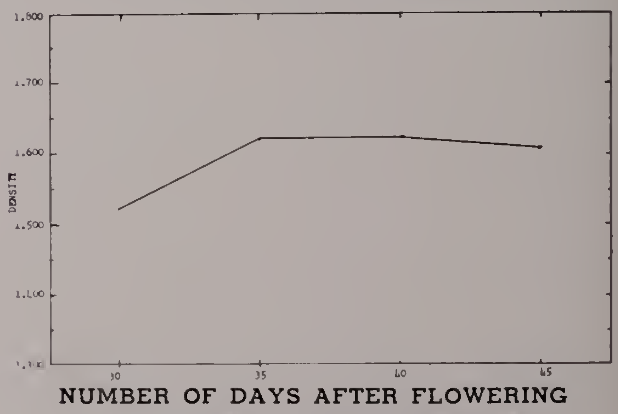


Fig. 3. Acala 4-42—Change in density with progressive stages of maturity.

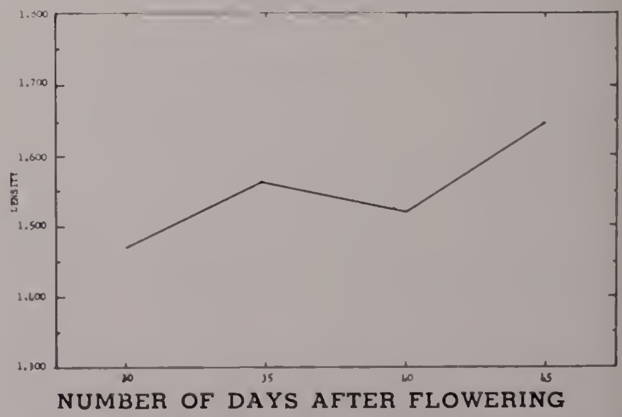


Fig. 4. 100-2-3-1-7 — Change in density with progressive stages of maturity.

Materials and Methods

Seven cotton varieties were tested and each of these at 30, 35, 40 and 45 days after flowering maturity stages.

Samples that were to be run the following day were left open over night in a testing laboratory. These samples had previously been run through the Shirley Analyser twice. The laboratory was kept within standard atmospheric testing conditions at all times. In addition to the samples the sec. butyl carbinol to be used was left open in the laboratory.

As the first step of the test fine wires that were to be used later to suspend fibers in the alcohol were weighed.[5] These were individually weighed in air and also in a suspended state in the alcohol.

Fiber samples were attached to the sample holding wires. These samples were not weighed before being attached but most were later found to weigh between .02 and .04 grams. After attachment each wire with its sample was weighed in air. The wired samples were then placed in 400 cc of sec. butyl carbinol and allowed to remain for 2 hours. The sample wires were crooked over the lip of the 400 cc beaker at such a point that all samples in all runs were the same depth in the liquid. The 400 cc was a constant throughout the project also. At the end of a 2 hour period the samples were transferred one at a time to a beaker of 150 cc of sec. butyl carbinol. This transfer was necessitated by lack of space for any larger beaker in the chainamatic balance cabinet. The transferred sample remained in the 150 cc for 12 minutes. After this period of time the 150 cc beaker was placed on a small platform within the chainamatic balance cabinet, and the weight of the fine wire with its sample suspended in the alcohol was taken.

During the days of testing the density of the sec. butyl carbinol was checked with a Mohr's balance. A sling psychrometer was used to check the laboratory recording hygrometer. The relative humidity and the temperature of the dry bulb were used as reference point on a Parks-Cramer Company cotton regain table to determine the proper regain to use during the various runs of the many tests.

Results

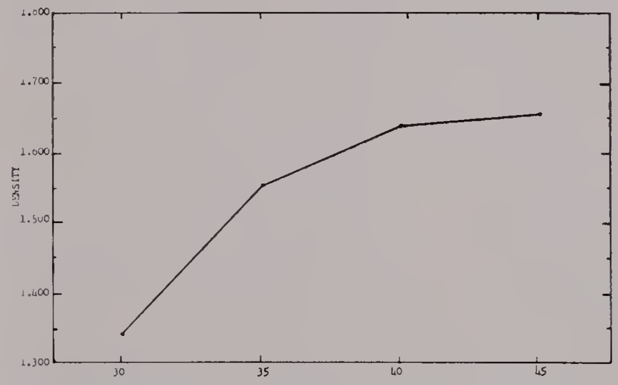
To determine the density of each of the 10 samples of the 7 varieties at each of the 4 different maturity stages the following was used:

$$D = \frac{(W - W_1) \times \left(\frac{100 - R}{100}\right)}{\dfrac{(W - W_1) \times \left(\frac{100 - R}{100}\right) - (W_2 - W_3)}{D_1}}$$

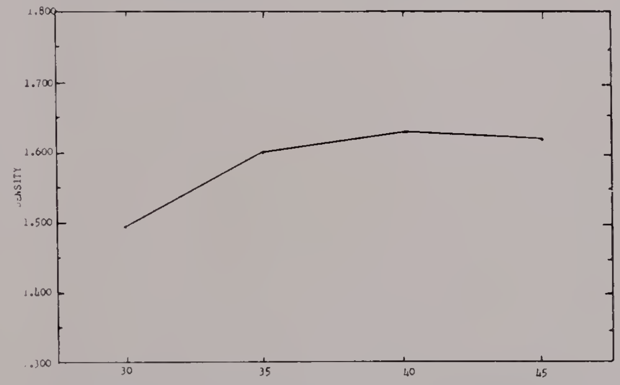
where

D = density of sample
W = weight of wire plus sample in air
W_1 = weight of wire in air
R = regain from Parks-Cramer table
W_2 = weight of sample plus wire in sec. butyl carbinol
W_3 = weight of wire in sec. butyl carbinol
D_1 = density of sec. butyl carbinol

The 10 density findings of any one variety at any one particular maturity stage were subjected to Chauvenets' criterion of rejection treatment. The mean density results after applying the criterion of rejection are shown in Table III.



NUMBER OF DAYS AFTER FLOWERING
Fig. 5. Coker Wilds — Change in density with progressive stages of maturity.



NUMBER OF DAYS AFTER FLOWERING
Fig. 6. Half and Half — Change in density with progressive stages of maturity.

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[5] All weighings during this project were made on a chainamatic balance equipped with magnetic damper.

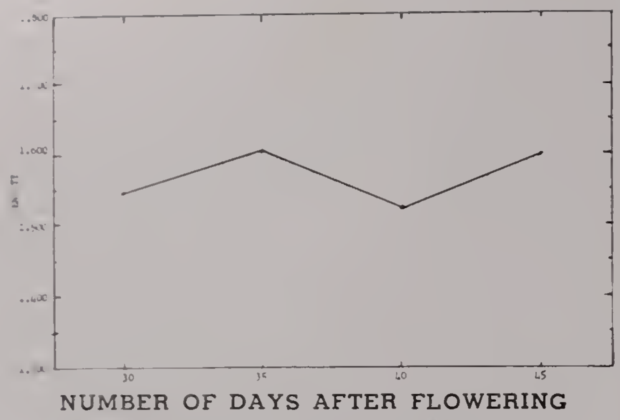

Fig. 7 200-1-3-3 — Change in density with progressive stages of maturity.

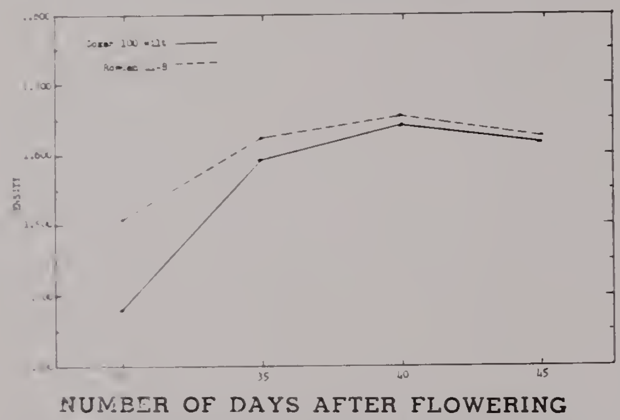

Fig. 8. Coker 100 Wilt and Rowden 41-B — Change in density with progressive stages of maturity.

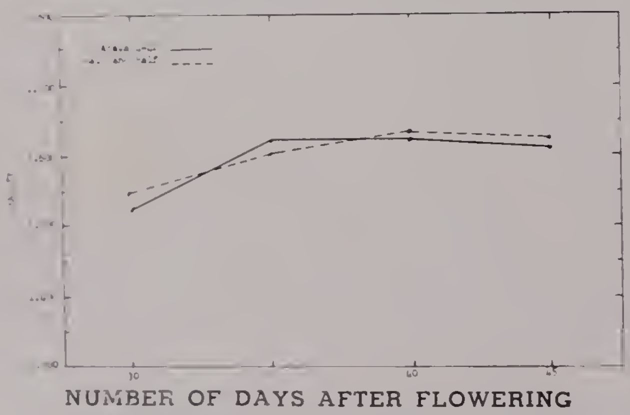

Fig. 9 Acala 4-42 and Half and Half — Change in density with progressive stages of maturity.

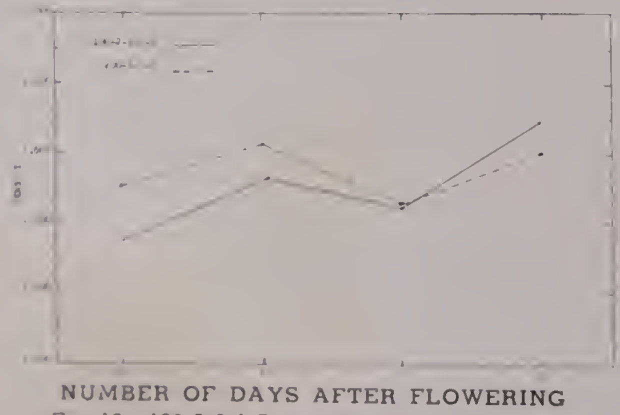

Fig. 10. 100-2-3-1-7 and 200-1-3-3 — Change in density with progressive stages of maturity.

Table III. Mean Density After Criterion of Rejection Applied

Variety	30 Days After Flowering	35 Days After Flowering	40 Days After Flowering	45 Days After Flowering
Coker 100 Wilt	1.381	1.595	1.643	1.617
Rowden 41 B	1.510	1.627	1.655	1.623
Acala 4-42	1.525	1.625	1.628	1.613
100-2-3-1-7	1.472	1.568	1.524	1.650
Coker Wilds	1.342	1.556	1.641	1.660
Half and Half	1.499	1.605	1.633	1.624
200-1-3-3	1.550	1.613	1.528	1.606

The mean densities listed in Table III are shown in graphic relation, by variety, in Figures 1 through 7.

Because of similarity of the density—maturity curves of Coker 100 Wilt and Rowden 41 B they are shown together in Figure 8. This also holds true for Acala 4-42 and Half and Half in Figure 9 as well as 100-2-3-1-7 and 200-1-3-3 in Figure 10.

Summary and Conclusions

1. Density, as found in this study, did not increase or decrease in a definite pattern with progressive stages of maturity of cotton fibers.
2. Of the 7 varieties tested there were 4 rather distinct patterns of change in density established.
3. The most pronounced and reoccurring fiber density change was the increase which took place between the 30 and 35 days after flowering maturity stages.
4. Sec. butyl carbinol gave strong indication of being a suitable agent to use if a method for determining fiber density similar to the one in this study is employed.
5. Further extensive research using quite a large number of samples at several maturity stages would better establish what change in fiber density does really transpire. This work, of course, would have to be performed using a fiber density determination method that could definitely be considered accurate in every respect.

Acknowledgment

The author wishes to express his sincere thanks to Dr. Hugh M. Brown for his guidance in this study.

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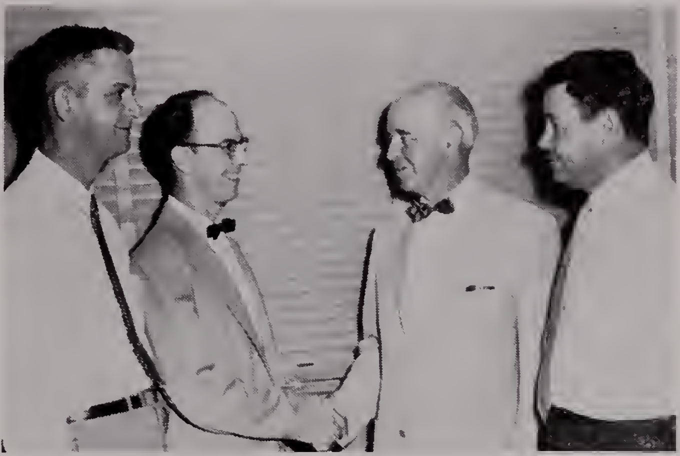
Woodside Mills Foundation Awards Scholarship to John T. White, Jr.

John Thomas White, Jr., of 305 O'Neal Dr., Anderson, has been awarded a scholarship of $750 annually up to four years College by Woodside Mills Foundation, according to Wm. H. Beattie, President.

Woodside Mills Foundation is offering one scholarship each year until there are four in effect at textile colleges. They are available to employees of Woodside Mills or to close relatives and are issued by the Woodside Mills Foundation. Each scholarship has a value of $750 for each academic year.

The first scholarship winner is employed at the Haynsworth Plant of Woodside Mills, Anderson, S. C., where he is presently employed as a Loom Fixer. He has had 10 years of textile experience and has taken a correspondence course in textile design. An honor graduate of Pendleton High School he plans to enter Clemson College this fall where he will major in textile engineering. He was an honor student throughout high school. He has been employed at Haynsworth Plant since 1952, where he takes an active part in church and civic affairs.



Mr. John White being congratulated by Mr. Wm. H. Beattie. Left to right: Mr. T. B. Phillips, superintendent of Haynsworth plant; Mr. White, scholarship award winner; Mr. Beattie, President; and Mr. J. H. Mason, General Manager, Synthetic Division.

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New Scholarships Available for Textile Freshmen

By Wayne Freed, TE '59

This year for the first time the Textile School of Clemson College has been able to offer scholarships to incoming Freshmen. These scholarships are a great stride toward recreating the interest and enthusiasm of entering students in the Textile School. This enthusiasm, which had declined in recent years in our school, is picking up, as evidenced by our increased enrollment for the 1957-58 terms.

These awards to entering students are based on high school records, entrance examination scores, and other conditions specified by the committee making the selections. Applications for these awards should be received each year by May 1, and the College Entrance Examination should be taken by May 15 for a student to be considered.

The scholarships for entering students are as follows:

1. **Leon Lowenstein Foundation Scholarships.** Two $2000 awards are available annually for male freshmen who enroll in the School of Textiles, to be paid equally during four years of satisfactory undergraduate study. Selection will be limited to applicants whose families have an income of $10,000 or less.

Leon Lowenstein Foundation scholarship winners at Clemson College pause during registration and matriculation schedules in Student Center lounge. Left to right—(seated) Charles Woodhurst, Williamston; William Reynolds III, Decatur, Ga.; Melvin Caldwell, Rock Hill; Harold Pryor, Columbia; (standing) Bruce Evans, Anderson; Charles Eubanks, Lyman; and William Kennedy, Manning. Freshmen are distinguished by their shaven heads. Absent when picture was taken were Gary Patterson, Anderson, and Gene Phillips, Gaffney.

AID TO FRESHMEN—The Leon Lowenstein Foundation presented the first freshmen scholarship assistance in the Clemson School of Textiles. Recipients were (left to right) William Reynolds, Decatur, Ga.; Bruce Evans, Anderson; Phil Kennedy, Manning and Charles Eubanks, Lyman.

2. **South Carolina Textile Manufacturers Association.** Two $2000 awards available for freshmen for four years. These awards will be based on high school records, entrance examination scores, and conditions specified by the scholarship committee.

3. **Texize Chemicals, Inc.** One $1000 award available for freshmen for four years. This award will be based on the high school record and other conditions specified by the committee making the selection.

(Left to right) H. B. Wilson, W. J. Greer, Robt. C. Hartzog and Mr. Klein.

In addition to the freshmen awards, the Textile School maintains an impressive scholarship program for undergraduate students. Recipients for these awards are picked by Clemson College in the spring for the coming school year. Applications for the awards should be returned to the Student Aid Office by February for consideration by the appropriate committees.

1. **American Viscose Scholarship.** A $500 award is available annually to a rising junior or senior majoring in Textile Chemistry or Textile Engineering.

2. **Blackman-Uhler Scholarship.** A $1000 award is available annually to a rising junior majoring in Textile Chemistry, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on need, ability and evidence of good character.

3. **Burlington Industries Foundation Scholarship.** A $1000 award is available annually to a rising junior majoring in Engineering or Textiles, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on leadership, scholarship and financial need.

4. **CIBA Scholarship.** A $1000 award is available annually to a rising junior in Chemistry, Physics or Textile Chemistry, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on scholastic ability, personal traits and financial need.

Robert Barker, 19, (right) a junior in textile chemistry, and Donald Logue, 25, senior in textile chemistry, are 1957-58 recipients of CIBA Textile Scholarships at Clemson College. Barker from Washington, D.C., is the son of Henry D. Barker, with the United States Department of Agriculture. Logue, from New Wilmington, Del., is the son of John C. Logue, with J. P. Stevens and Company, Pendleton.

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7. **Seydel-Woolley Company Scholarship.** A $250 award is available annually to a rising junior or senior male student majoring in Textile Chemistry or Textile Engineering. Selection is based on scholastic ability, evidence of leadership potential to the southern textile industry, and financial need.

There are also three fellowships awarded under our present scholarship program. The list of scholarships and fellowships includes the following:

1. **Celanese Fellowship.** A $1500 award plus tuition, fees and research materials is available annually to an outstanding student for graduate research in Textile Chemistry.

2. **Dow Corning Fellowship.** A $1500 award plus tuition, fees and research supplies is available annually to an outstanding student for graduate research in Textile Chemistry.

3. **Institute of Textile Technology Fellowships.** One or more $1125 awards are available annually to outstanding students in the School of Textiles for further study at the Institute.

The students of the Textile School who have received these awards join hands with the College officials in thanking those people and firms who have made these scholarships available. We hope that these and more groups will continue to help us so that we might continue our educations in a way that might otherwise be impossible.

8. **Keever Starch Scholarship.** A $400 award is available annually to a worthy rising sophomore majoring in textiles.

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POUND FOOLISH

(Continued from page 13)

sia no furs, Cuba no sugar cane, and France no champagne, why in the name of common sense do we sit back and let a bunch of star-gazing, bubble-headed, satchel-mouthed mountebanks flood this nation with textiles from overseas?

The answer to this, of course, is very simple. The strong prey upon the weak. If we let our own customers push us around, isn't the Government going to push us around too? If ever an industry needed men of intelligence, skill, ingenuity, and just plain, old-fashioned guts, the textile industry needs those men now. If the petroleum industry, the steel industry, and other industries can take care of themselves, why can't we take care of ourselves.

The time for action is now! The house of textiles can and must be placed in order. While sharp trading buyers and an unfriendly government are working us over with the one-two punch, it is not beyond the realm of possibility for organized labor to step in and deliver the **coup de grace** that will leave this nation entirely dependent up imported textiles.

Let's review our methods. If we are not up-to-date, we had better take steps to get that way in a hurry. If our staff can do the job, let's get them started on it at once. If they can't, we had better call in a consultant. It is better for us to call in doctors than for our wives to call in undertakers.

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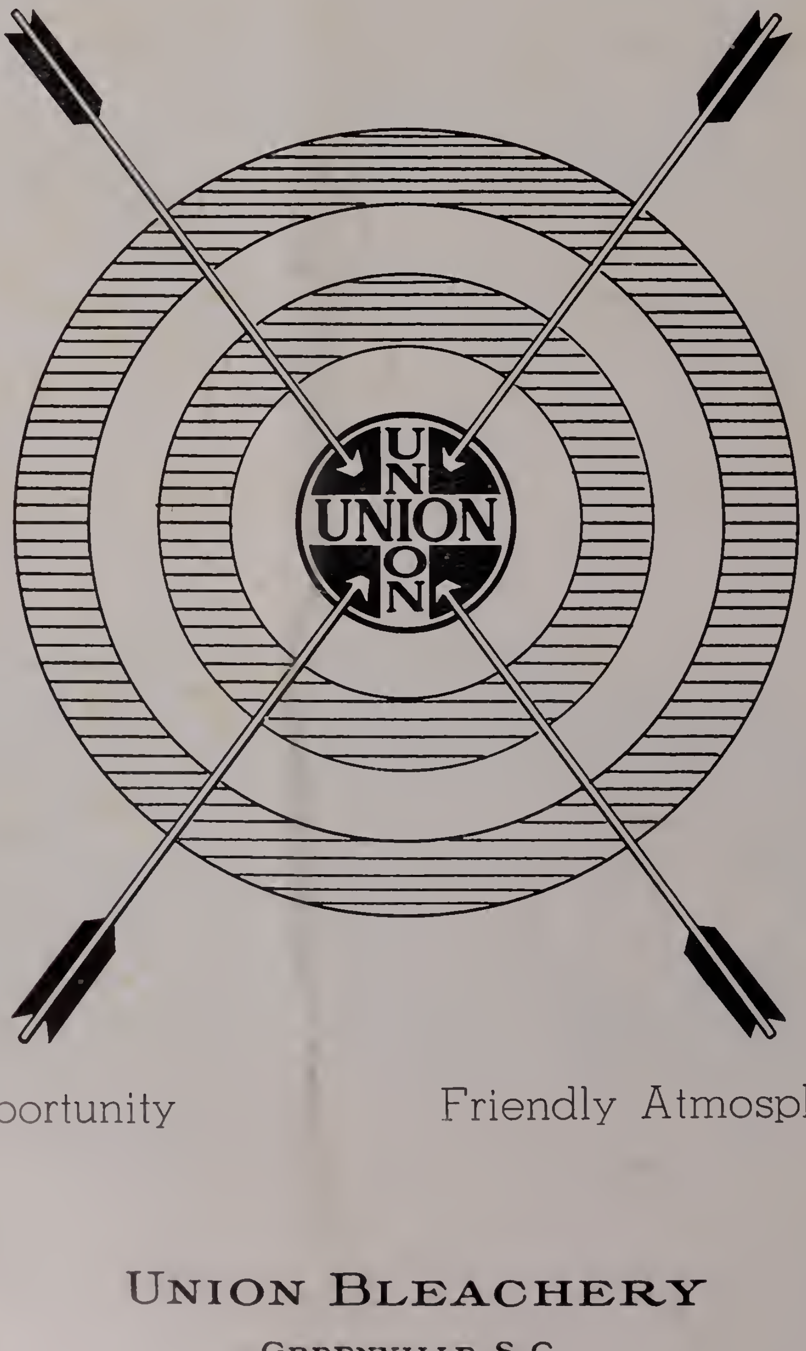

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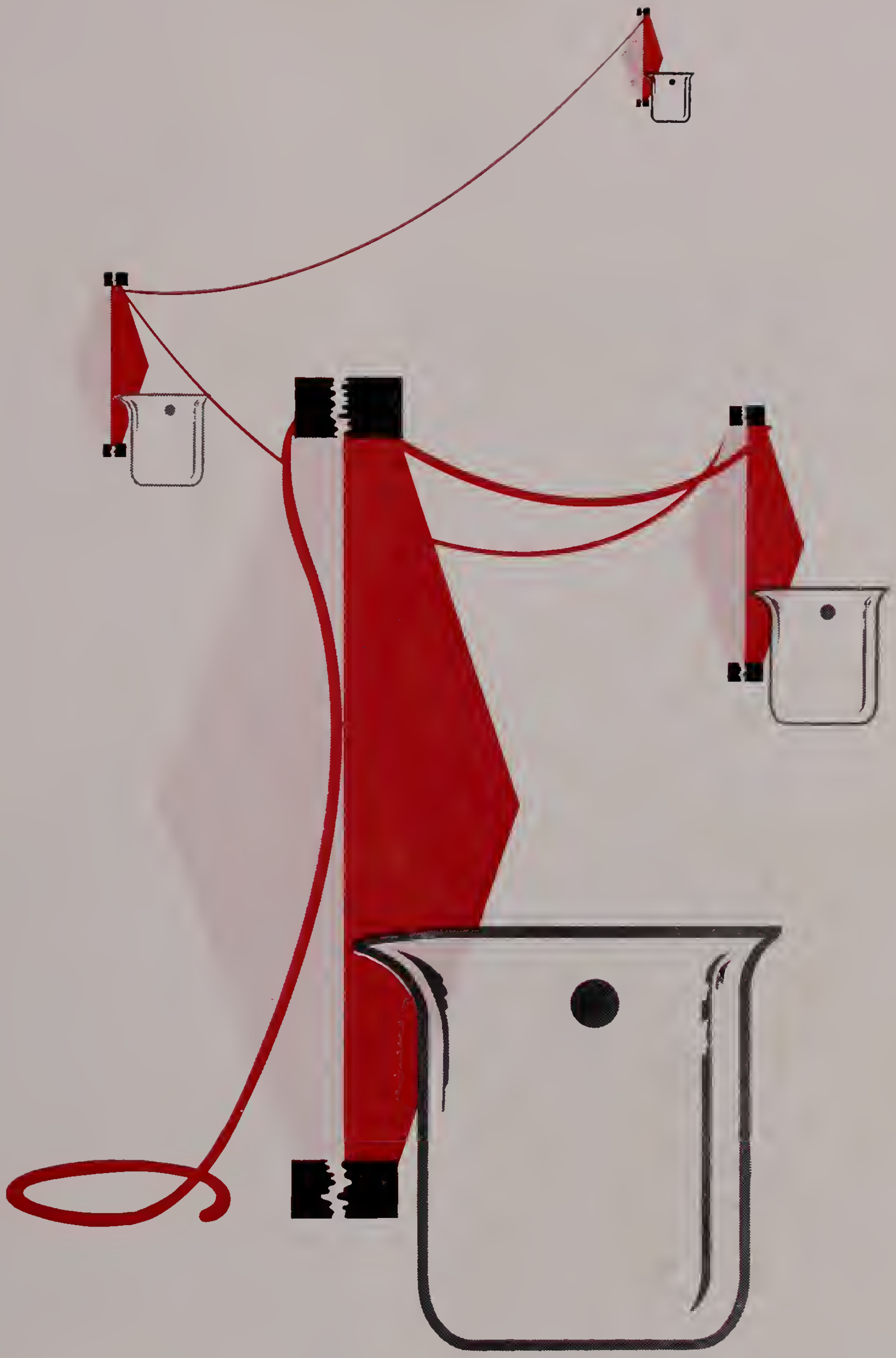

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Clemson Textile School

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COVER: Russ Campbell.

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Guest Article

YOUR COLLEGE CAREER

Alfred G. New, Plant Manager
Judson Mills
Greenville, S. C.

The young man who is entering college today has before him a wonderful opportunity to prepare himself for a successful career in many fields of endeavor. He is entering one of the most important periods of his life and should establish definite plans and goals for accomplishment. To a great extent, the type of job which he will obtain when he graduates will be governed by the record that he has made during the four years of his college career. For this reason, I will offer a few remarks that I hope will be of some assistance to the young man who is ambitious and seeking to get ahead. In presenting these thoughts, I make no claims to being either sage or philosopher, but am only passing on to you my observations and those of others in our company who have had experience with the placement and training of college graduates.

For the first time, in many cases, the college freshman is released from the ties of his home and family. He has the freedom to choose the way he is to spend his time during the evening and on the week ends. It is most important that this time be used wisely. Moral values must not be thrown aside. Affiliation with the campus church of his choice is highly desirable, for there he will have the opportunity of developing one phase which is not always covered in the class room. Low moral standards have caused the downfall of many otherwise successful businessmen. Enough emphasis cannot be placed on this phase of the development of the college student.

Another ability which all of us constantly seek to develop is that of getting along with other people. Lack of ability in this area has caused the failure many times of capable and intelligent men. We constantly strive in our company to develop this ability in our supervisors, engineers, and management. The college student has many opportunities to develop his ability to deal with other people. The courses which are offered in psychology reveal the motivating impulses of man. Too often the student engineer passes over these courses lightly with the feeling that, after all, he plans to be engineer and not a psychologist. True, this is the case; however, we have not been able to locate a job in which the individual will not have to deal with other people. I would not hesitate to say that over 90% of our problems pertain to personnel, with the remaining small percentage being technical problems. The student who does not recognize this situation and does not do everything in his power to prepare for it is faced with a difficult road ahead. Study and practice the art of getting along with your fellow man.

There is another segment of your college education which I am afraid too many students take lightly. The courses offered to you in English, Public Speaking, and the allied fields are most important. Although, the engineering and technical students are often criticized for not placing proper emphasis on these subjects, surprisingly enough we find many graduates of liberal arts schools who are woefully weak in this area. When the college graduate becomes employed, he can expect to be called upon for various types of reports. At first, these reports may concern primarily his experiences in the company; however, as he progresses, he will become more and more responsible for preparing other types of business reports. In many cases, he will be appraised by the type of reports that he submits. It is not always easy to prepare these reports in a concise, informative manner. A good background in English is essential. The same remarks would pertain to public speaking. Most of us do not plan to make careers of public speaking; however, none of us can avoid the responsibility of verbal presentation of our thoughts and work as we embark on a business career. Learn to speak and write well and practice what you have learned.

The three areas of possible development which have been discussed are most important in your college career. The college student who recognizes these areas and takes advantage of every opportunity to improve himself will be rewarded.

Participation in extra curricular activities is desirable. When the student graduates and becomes eligible for employment, the application which he will be asked to fill out will probably request that he list the record of his extra curricular activities. Do not join organizations for the sake of joining. Become a participant in the activities rather than just a member of an organization. The student who has participated to the extent that his fellow students have elected him to an office of responsibility has gained considerably from his affiliation with the organization. He is developing strong leadership potential and a sense of responsibility which will carry him far. Belong to and participate in worthwhile organizations.

The student should not overlook his responsibility to his parents and himself to attain the best possible scholastic ratings. It is likely that most students can, with a little more diligence and application, attain better grades at the same time that they are participating in a well rounded program of self-development. The graduate's scholastic standing will be one of the factors considered by the potential employer. You will note that I state "one of the factors" and do so purposely, for I do not want to leave the impression that it is necessary or desirable for the student to become a "book worm." Develop those talents which God has given to you.

Another suggestion which could be offered is that the student seek to spend the summer vacation periods in work that will relate to his chosen field of endeavor. Most progressive companies offer college students the opportunity of working with them during the summer months. Disregarding the financial advantages of such opportunities, the experience by the student in such work will be most valuable. The contacts with the people on the job will help to develop the ability of getting along with other people. The student will have the opportunity of evaluating the company which has employed him and the company, in turn, will have the opportunity of evaluating the performance of the student. Certainly, the company will feel an obligation to consider for permanent employment upon graduation, the student who has served well during the summer months prior to graduation.

While the young man is in college, he has the opportunity of developing his sense of loyalty. Things will not always go to suit each individual; however, the man who remains loyal to his associates when conditions are somewhat rough will move ahead with a feeling of pride rather than dropping back with a feeling of frustration. Constructive criticism is always desirable. Unjust or destructive criticism will harm the individual offering the criticism more than anyone. Be loyal to your family, be loyal to your college, and, when you go into business, be loyal to your company and business associates.

The opportunity is yours. There are two roads ahead for college students. One road offers the so-called easy way. He can take the line of least resistance and emerge with a college diploma and little else. The other road calls for a planned program and hard work. From this road, he will emerge with a diploma and a four-year record of achievements of which he may well be proud. When the student has traveled this road, he will have developed a way of life which will carry him far. Industry will seek him. He will have the opportunity of opening the door into a successful future.

To you, the college student, I pose the challenge. Which road will you take? What will **you** make of **your** college career?

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Gaston Gage Appointed Acting Dean

By Ken Powers

On the first day of July this year, after the retirement of Dean Brown, Professor Gaston Gage was appointed Acting Dean of the School of Textiles, Clemson College, Clemson, South Carolina.

Professor Gage was born in 1898 at Chester, South Carolina, attended Chester's graded schools and graduated from Chester High School. He attended the University of South Carolina, served briefly in World War I, and entered Clemson College in January, 1919, after being discharged from the Army. He graduated from Clemson College in Textile Engineering in 1921.

After leaving Clemson, he went to work for Baldwin Mills at Chester, which later became one of Aragon-Baldwin group of J. P. Stevens & Co., Inc. Mr. Gage worked here until the summer of 1932, serving as paymaster, second hand of the weave room and overseer at various times of the card room, spinning room and cloth room. He returned once more to Clemson in September 1932, as an instructor in the Yarn Manufacturinng Department of the Textile School. He was promoted to Associate Professor in 1943, a full professor in in 1946, appointed head of the Yarn Manufacturing Department in January 1949, and was appointed Acting Dean of the School of Textiles on July 1, 1957.

Professor Gage has served on the Faculty Athletic Committee and on the class schedule committee for over twenty years, and has also served one six-year term as Trustee of the Calhoun-Clemson School. He is also proud of the fact that he was at the organizational meeting of IPTAY, was a Charter Member, and has been a continuous member ever since.

Mr. Gage was married to Ruth Vardell on April 9, 1927. They have two sons, both of whom graduated from Clemson in Textile Engineering, one in 1951, the other in 1955.

Professor Gage is a member of the Kappa Alpha Order, Phi Psi Fraternity, the American Society for Testing Materials, the International Organization for Standardization, the American Society for Quality Control, and the Southern Textile Association. He is also an active member of the Clemson Methodist Church.

"For a good many years," said Professor Gage, "fox hunting has been my hobby, but the nights got a bit too cold and long, and so I have now concentrated on bird watching."

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Clemson Chapter Receives S. A. M. Charter

By
Alan Bell

Clemson's Chapter of the Society for Advancement of Management received its charter in a very impressive meeting held in the Gold Room of the Clemson House November 12.

Mr. Alfred New, President of the Senior Chapter of S. A. M. in Greenville, presented Mr. Norville Spearman, President of Clemson's student chapter, with the charter. Mr. New is known for his outstanding work toward the Greenville Chapter's advancement; also, he is Plant Manager of Judson Mills, a part of the Deering-Milliken chain.

Mr. Hezz Stringfield was principal speaker at the meeting. He is National Vice-President of S.A.M. Southeastern Region, and is Executive Assistant to the Director of Oak Ridge National Laboratory, Union Carbide Nuclear Company.

Clemson Chapter members were the dinner guests of the Greenville Chapter at the presentation-dinner meeting. President Spearman of the Clemson Chapter conducted the meeting and he expressed the student members' gratitude to the Greenville Chapter for the interest its members had shown in coming from Greenville for the charter presentation.

Possession of this charter for Clemson's S.A.M. group will give added recognition to its members as they go out into their individual fields and will give the remaining members and future members of the organization a closer tie with other similar groups in numerous colleges and universities throughout the nation.

Phi Psi Tours Wunda Weve and Steel Heddle

By
Wayne Freed

Seventeen members of Phi Psi, accompanied by Professor E. A. LaRoche and Mr. Deolindo Dominguez Vicente, Department Head, Federal Technical School of Chemistry and Textile Industry, Rio de Janeiro, Brazil, spent a day in Greenville touring the Wunda Weve Carpet Company and Steel Heddle Manufacturing Co., Southern Shuttles Division.

The group toured Wunda Weve first and were met by William Pate, Jr. Billy gave a brief background talk to the group in the conference room of the plant. He explained that the company made cotton, synthetic, and wool-synthetic blend rugs at their plant. The company employs a sales staff of about 35 who cover the nation.

Billy then went on to explain the basic processes in their rug manufacturing which include in their proper order: beaming, quilling, weaving, inspection and burling (repairing defects), finishing, inspection, latex coating of back, re-inspection, and shipping. Special sizes and colors are also made to order. An explanation sheet was also distributed in conjunction with the talk.

William Pate, Sr., President of the company was introduced and he welcomed the group. R. W. Crouch and D. L. Latham of the research and development department were also present to broaden the explanation of the workings of the plant.

The group was divided into three parties led by Mr. Latham, Mr. Crouch and Mr. Pate. Each party then toured the entire plant, watching all the processes and asking their guides many questions.

The tour ended when the parties again met in the conference room. Mr. Alex Mumford, Public Relations Director, talked informally with members of the group, and then souvenir pens and pocket notebooks were distributed to all.

The group then proceeded to Steel Heddle where they were welcomed by Joe Leaphart, the Personnel Director, and Clarence Frye, the Assistant Personnel Director. The group proceeded to the plant cafeteria where they had a very pleasant dinner.

The group then split into two parties led by Mr. Leaphart and Mr. Frye. The parties went through the plant and saw all the processes that are undergone in the manufacture of shuttles.

The group first went through the machine shop where the shuttle eyes are made. Then it proceeded through the electroplating lab where much contract work for automobile dealers with chrome plating is done.

Next the group went through the shuttle plant where the many processes in making the actual shuttle body were carried on. The group viewed each individual process through to the finished product.

The group also viewed the plant foundry in operation before returning to the conference room. Mr. Leaphart closed the tour by giving each of the Phi Psi group a souvenir shuttle with a thermometer.

Mills Suffer on Cotton Program

The federal government's two-piece cotton system, which has been torturing textile mills for some time now, got a lusty verbal batting around from the first vice president of the American Cotton Manufacturers Institute recently.

The ACMI official, Halbert M. Jones, president of Waverly Mills, Laurinburg, N. C., said in a speech here that the government policy is "ridiculous" and that it "hurts everybody concerned."

Under the two-price system, the government takes U. S. cotton under the price support program and sells it on the overseas market at a price 20 per cent below that which American mills must pay. Mr. Jones said:

"American manufacturers and consumers, of course, are the big losers because they must pay the higher price for their cotton and cotton fabrics. The manufacturers are forced to compete with foreign imports manufactured by extremely low-wage labor using cheaper raw material.

"Even foreign textile men, who are permitted to buy this cheaper cotton, say the policy is harmful because it makes market unstable.

"This program also has injured the cotton farmer. The artificial price of cotton has been a dominating factor in the sizable reduction in the amount of cotton consumed in the United States.

"Cotton's position in the textile markets will continue to weaken unless and until there is a realistic one price system for American cotton throughout the world."

The ACMI leader said that he is hopeful that the session of Congress starting in January will find a satisfactory solution to the problem.

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Phi Psi Pledges Twelve

This year Iota Chapter of Phi Psi had 12 initiates who, through their hard work, have shown excellent grades in their scholastic reports. These men have been chosen from the upper one-fifth of the junior class and upper one-third of the senior class. The top two men from the sophomore class were also eligible for consideration.

The new brothers of the honorary textile fraternity are: Seated (L. to R.) Jack Lynch, TC, Inman; John D. Turner, TC, Inman; Cecil Hunter, TC, Green Mountain, N. C.; William J. Allred, TC, Clemson; Charles Woodhurst, TE, Williamston; Ronnie D. Eaddy, TE, Johnsonville. Standing (L. to R.) are Dong Wha Kim, TE, Seoul, Korea; William Emory, TE, Spartanburg; Wayne Freed, TE, Aiken. Not present for the photograph were Robert Barker, TC, Washington, D. C.; Melvin Caldwell, TC, Rock Hill; and Harold Lingerfelt, TM, Morristown, Tenn.

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N. T. M. S. Sponsored Group Visits Celriver Plant at Rock Hill

By
Wayne Freed

Recently, a group of fifty-one students and four faculty members visited the Celriver Plant of the Celanese Corporation of America located at Rock Hill, S. C. This trip was organized by the Clemson Chapter of the National Textile Manufacturers Society.

Immediately upon arrival, the group was conducted to the plant conference room where they were greeted by members of the plant management including B. H. Sands, Personnel Manager; J. C. Richmond, Training Director; and H. M. Parsons, Production Engineer.

Mr. Parsons gave a complete run-down on the preparation of "cellulose-acetate" with particular emphasis on the parts of the process from which the textile students might get the most benefit. The chart which Mr. Parsons used in his talk is shown, and a breakdown of his talk is as follows:

The basic process at Celriver is divided into two sections: the chemical processing section where the basic raw material, cellulose acetate, is manufactured; and the textile section where the yarn is made and prepared for shipment.

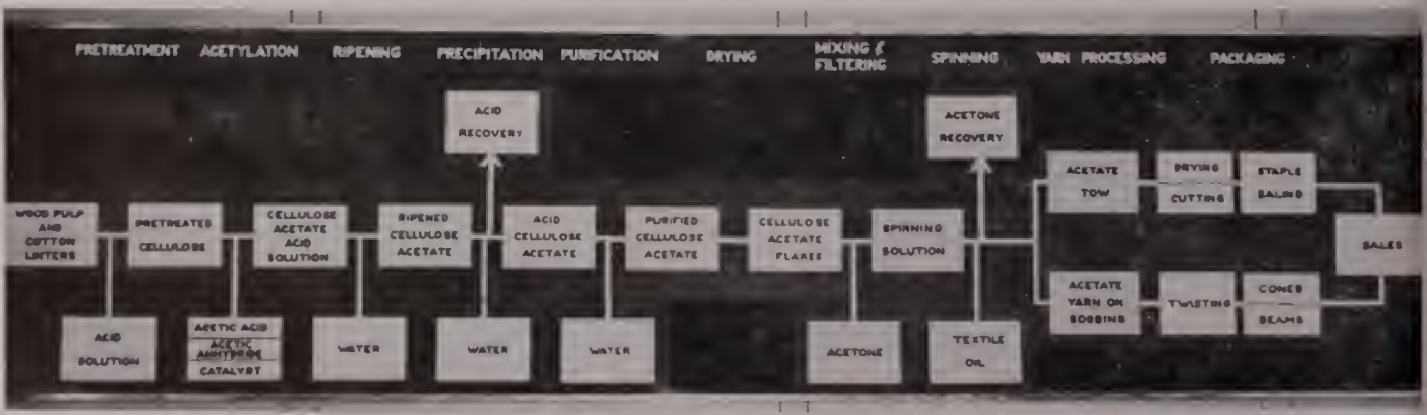
Cellulose Acetate Preparation. The raw material for acetate yarn is cellulose acetate flake which is manufactured from the basic raw materials, cellulose and acetic acid. Cellulose is received in large rolls of wood pulp which are produced by a Celanese affiliate in British Columbia. The wood pulp is highly purified and contains about 99 percent alpha cellulose. The wood pulp is ground in attrition mills to make it more accessible for the reaction to follow. The first step in the reaction is the pre-swelling of the cellulose fiber with ascetic acid to make the cellulose more reactive. This step is known as pretreatment. The pretreated cellulose is reacted with a mixture of acetic acid and acetic anhydride together with a suitable catalyst. During this reaction cellulose triacetate is formed. Cellulose tri-acetate is not soluble in acetone and a reverse or de-acetylation must be accomplished to obtain an acetone soluble product. This de-acetylation is called by the general term of ripening.

At the Celriver Plant, two types of cellulose acetate are made. They are normal or secondary acetate and tri-acetate which is presently sold under the trade name "Arnel". The main difference in the process is that tri-acetate flake does not undergo the ripening step described above and, as will be described in the textile section to follow, is not spun from an acetone solution.

When the cellulose acetate leaves the ripeners, it is in the form of a thick dope. This dope is composed of cellulose acetate dissolved in acetic acid. It is necessary to separate the C. A. and the acid. This is done by precipitating the flake from the acid solution. Cellulose acetate is soluble in acetic acid as long as the acid concentration stays above 55 per cent. Therefore, to precipitate the cellulose acetate from the acid, sufficient water is added to the dope to reduce the acid concentration to 30 per cent. At this point, the great majority of cellulose acetate leaves the solution as a white flake, somewhat resembling asbestos. This flake is washed acid free and dried for transfer to the Spinning Department.

Considerable quantities of weak acid are obtained during the preparation step. This acid is concentrated to 100 per cent by a solvent extraction distillation process and is reused in the process.

Spinning and Textile. The asbestos like cellulose flake is dissolved in acetone and given a thorough filtration, preparatory to yarn spinning. A thorough filtration is necessary to remove all foreign particles



as the acetone dope solution must be forced through a spinnerette containing holes as small as 40 microns. The spinning operation is basically an evaporation procedure. The spinnerette through which the acetone dope is pumped is placed at the top of a heated cabinet. The streams of solution from the filaments fall through the heated cabinet and the acetone is evaporated leaving a filament of cellulose acetate. These filaments are passed over a feed roll to control the speed and are taken up on bobbins.

The bobbins from the spinning machine are transferred to the Twisting Department where the desired twist is put into the yarn. After twisting the yarn is put on cones or bobbins for shipping to the customer.

This process just described was the preparation of continuous filament yarn. Staple fiber is made in approximately the same way through the spinning section; however, the yarn from the spinning machine is not taken up on bobbins as in the case of continuous filament. The continuous stream of yarn from the spinning machine is processed through a crimper where a crimp is added to the yarn and then to a cutter where the yarn is cut into the desired staple length. Any length staple can be produced. After cutting, the staple fiber is baled and wrapped for shipment.

Arnel or tri-acetate yarn is manufactured in the same way as acetate yarn, except that another solvent must be used in place of acetone as the triacetate is not soluble in that solvent.

Following the talk, the group was divided into seven parties which then took a complete tour of the textile section of the plant. The individual groups were guided by Coy Hewett, D. B. Mattox, R. G. Higgins, H. H. Williams, W. C. Wylie, J. W. Free, and Dennis Betts. Questions were asked the guides as the the tour progressed, and were answered to the satisfaction of everyone.

Following the tours, the group reassembled in the plant cafeteria for a lunch provided by Celanese. Further questions were answered, following the lunch, and then the group returned to Clemson.

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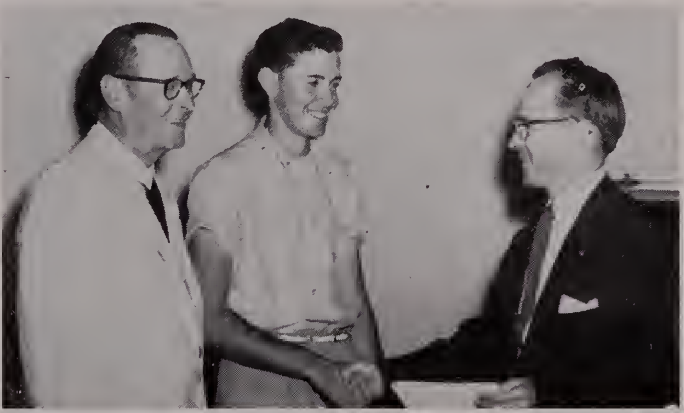
J. P. Stevens Scholarship

Through the South Carolina Textile Manufacturers' Association, the J. P. Stevens Scholarship is awarded to a Freshman. The scholarship pays $500 per year for four years. The first of these scholarships went into effect last year and continues through four years. Another scholarship was awarded this year and grants will be awarded annually until four $2000 scholarships are in effect.



Prof. H. B. Wilson, Field Representative, School of Textiles, congratulates Vernon Gaskins, winner of the first J. P. Stevens & Company scholarship in the School of Textiles at Clemson. Mr. John K. Cauthen, Vice-President, S. C. Textile Manufacturers Association looks on.

Money in Cotton? Ask J. Harris

It isn't fair to call Jack Harris of Fresno, Calif., a "typical" cotton farmer. He isn't. With 12,00 acres of land to plant, his "patch" is big business.

But Jack Harris concedes what many a colleague denies—there's plenty of profit in cotton at 36 cents a pound. And Jack Harris proves it.

Earlier this year, Harris took 1,600 acres of his land out of production under the soil-bank subsidy program. The government paid him $209,000 for leaving the acreage idle.

On the rest of the land, he raised 10,436 bales of cotton beyond his authorized allotment.

The government cracked down and assessed a penalty of 18½ cents a pound on the "excess cotton." Harris paid $965,595. Almost cheerfully.

It cost him about 15 cents a pound to produce the lint, he reports. He sold it at 36 to 37 cents. Even after the penalty charge, he made a lot of money.

And what does he think about crop controls and price supports?

"Ridiculous," he says. "I believe we need some kind of cotton support for domestic consumption, but I think we should be able to compete on world markets without controls or guarantees."

Jack Harris isn't typical. But he makes an interesting point.

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Where Are They Now?

A survey was made of the Class of 1947 from the School of Textiles. Listed below are the names, positions and home addresses of the graduates who were located.

Abernethy, Ernest E. Jr., Sales Manager, International Textile Machine Co.; 400 Allendale Place, Charlotte, N. C.

Brady, John L., Manager Southern Accounting Office, Reeves Brothers, Inc.; 206 Foxcross Rd., Spartanburg, S. C.

Broadwell, William E., Quality Control Engineer, Deering Milliken Service Corp.; 503 E. Cohen St., Union, S. C.

Christenberry, T. E., Salesman, Bemis Brothers Bag Co.; Box 3364, Station A, Greenville, S. C.

Clark, James R., Jr., Superintendent, Woodside Mills, Greenville Plant; 3 Charles St., Woodside, Greenville, S. C.

Clark, W. D., Gen'l Sales Mgr., Textile Division, Celanese Corp. of America; 2628 Danbury St., Charlotte, N. C.

Crawford, Lewis A., Assistant Sup't., Joanna Cotton Mills Co., Box 147, Joanna, S. C.

Crowther, R. R., Exec. Vice-Pres., Fort Hill Bank & Trust Co.; Sunset Dr., Clemson, S. C.

Davis, Joseph W., Dept. Overseer—Weaving, Dan River Mills, Inc.; 427 Hampton Dr., Danville, Va.

Deaton, James E., Foreman, General Electric Co., Little Mountain, S. C.

DeLoach, Francis B., Sales, Seydel-Woolley & Co., Atlanta, Ga.; 205 E. Park Dr., Spartanburg, S. C.

Ellis, Paul B., Jr., Technical Staff, Springs Cotton Mills, P. O. Box 484, Fort Mill, S. C.

Garvin, Noel E., Plant Mgr., Cascade Mills, Burlington Industries; 146 Park St, Mooresville, N. C.

Goodman, M. Riggs, Sup't., Burlington Industries, Box 161, Shannon, Ga.

Heaton, Mack D., Ass't. Sup't., Columbia Mills Co.; 820 "K" Ave., Cayce, S. C.

Jackson, Fowler, Jr., Engineer, Standard - Coosa-Thatcher Co.; 404 E. Ladiga St., Piedmont, Ala.

Josey, H. A., Cost Engineer, Dan River Mills; 301 Randolph St., Danville, Va.

King, William Harry, President, IPA Southern, Inc.; 205 South "C" St., Easley, S. C.

Lee, David Carlisle, Supervisor of Production Engineering, Utica-Mohawk Cotton Mills, Division of J. P. Stevens & Co.; Route 5, Seneca, S. C.

Lindsay, William Edward, Planning, J. P. Stevens & Co.; 10 Maple St., Great Falls, S. C.

Littlejohn, W. M., Supervisor, Cost Section, Woodside Mills; 23 N. Garden Circle, Greenville, S. C.

Lowman, John B., Foreman, General Electric; 716 Arrowwood Road, Columbia, S. C.

Martin, William Russell, Technical Sales Specialist, Chemstrand Corporation, Decatur, Ala.

Merritt, Carl F., Sales Representative, The Hubinger Co.; Box 346-A, Piedmont, S. C.

Mills, V. R., Chemical Salesman, Seydel-Woolley & Co.; Box 853, Opelika, Alabama.

Phillips, Robert M., Leader, Nylon Development Unit, American Enka Corporation; 10 Hillcrest Rd., Enka, N. C.

Robinson, Grady P., Overseer, Carding Department, Springs Cotton Mills, Eureka Plant; 884 Robbins Circle, Chester, S. C.

Rogers, Frank C., Jr., Vice-President, Reeves Brothers, Inc.; 132 Fairmount Ave., Chatham, N. J.

Seacord, James E., Jr., Ass't. Southern Mgr. & Salesman, Ashworth Bros., Inc., 4013 Hough Road, Charlotte 9, N. C.

Sinclair, Carl W., Production Control Supervisor, Oak River Mills, Bennettsville, S. C.; 12 N. Main St., Clio, S. C.

Sutherland, A. C., Salesman, E. I. du Pont Co.; 1710 North Erb St., Appleton, Wisconsin

Tigler, Leon, Technical Director, Eagle & Phenix Division, Reeves Bros., Inc.; 3025 Melrose Dr., Columbus, Ga.

Toms, R. B., Supervisor, General Electric Co.; 13 John Ross Rd., Rome, Ga.

Turner, T. A., Jr., Vice-President (in charge, Southern Division, N & W Industries, P. O. Box 809, Jackson, Mississippi

Turner, H. Barrow, Vice-President, N&W Industries, Inc., 3805 Peakland Place, Lynchburg, Va.

Waits, James Kelly, Head, Stnd's Dep't., Jonanna Cotton Mills; Joanna, S. C.

Walker, David W., Industrial Engineer, Eagle & Phenix Div., Reeves Bros., 3224 Camden Dr., Columbus, Georgia

Watson, D. A., Chief Chemist, the Springs Mills, Grace Bleachery; 723 W. Grace Ave., Lancaster, S. C.

Whitten, Wm. C., Jr., Associate Professor, Clemson College; Box 656, Clemson, S. C.

Sirrine Library Serves School and Industry

By
C. Lamar Greene

A year ago, the Textile School Library was opened in its new location in the west wing of the Textile School. During that time, the Library acquisitions have grown considerably and the Library has been a source of reference for the Textile students and faculty, other departments of Clemson College, and members of various textile organizations. The J. E. Sirrine Textile Foundation provides funds for the library, which is operated as a sub-division of the Clemson College Library.

To accommodate those who are unable to use the library during the day and to provide a place of study for the textile students, the Library is open twice a week, on Tuesday and Thursday evenings from 7 until 10 P.M. A typewriter and a calculator are available in the work-room adjoining the library for the use of the students throughout the day and during the evening hours.

A Library Committee, headed by Dr. James H. Langston, and including a member of the faculty from each department, meets with the librarian to select new material to be added to the library. The latest available texts in the fields of textiles, management, chemistry, physics and related subjects have been acquired during the past year. In addition to its own collection, books that the library does not have, or cannot secure, are available through inter-library loan from other libraries. Any suggestions regarding material to be added would be appreciated The library would also be grateful for any donations of books from its readers.

Currently received, and annually bound, are the following publications. Many of these are indexed according to subject, author and title and are a valuable source of reference. Listed below are those periodicals bound in the Library:

Periodical	Years Bound
Advanced Management	1955 through 1956
Amer. Assoc. for Textile Technology	1948 through 1956
American Dyestuff Reporter	1942 through 1956
American Fabrics	1946 through 1957
American Society for Testing Materials Bulletin	1947 through 1956
America's Textile Reporter	1942 through 1956
The Bobbin & Beaker	1940 through 1957
Ciba Review	1945 through 1956
Instruments & Automation	1949 through 1956
Journal of the Textile Institute	1932 through 1949 1951-1956
The Knitter	1943 through 1956
Management Review	1957
Modern Textiles Magazine	1946 through 1956
Personnel	1957
Textile Age	1951 through 1956
Textile Bulletin	1941, 1948 through 1956
Textile Industries	1939 through 1956
Textile Technology Digest	1947 through 1950
Textile Research Journal	1939 through 1956
Textile World	1949 through 1957
Whitin Review	1949 through 1957

Other sources of reference include the trade journals, technical service department publications, textile association publications, and the latest catalogs of textile and textile finishing machinery. Listed below are some of these publications which are on file in the textile library:

Agricultural Newsletter (du Pont)
American Cotton Manufacturers Institute Bulletin
American Cotton Manufacturers Institute Economic Report
Aminco Laboratory News
Apparel Manufacturer
Avisco News
BCA News
Better Living (du Pont)
Control Engineering
Celanese Corporation of America—Technical Bulletins
Chemstrand Corporation—Technical Processing Manual
Cyanamid Pigment News
Cotton Situation (U.S.D.A.)
Cotton Textile Hi-Lights
Cotton Trade Journal
E. I. du Pont de Nemours Technical Service Bulletins
Daily News Record
Dyestuffs
Educational Focus
Educational Record
Factory Management and Maintenance
Globe Review
Good Year Chemical Division Manual
Hosiery Industry Weekly
Hosiery & Underwear Review
Industrial Quality Control
Textile Research Institute Membership News
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Tri-State Safety Journal
Trained Men
Underwear News
U.S.D.A. Agricultural Research Bulletins
U.S.D.A. Agricultural Marketing Service
Wall Street Journal
Westinghouse Engineer
Wool Bureau Science & Technology Reports
Wool Science Review
Wright Air Development Center Technical Reports

Outstanding Textile Seniors

By
Charles Bagwell

David J. Spearman, is a Textile Manufacturing Senior and he and his wife are presently living in Greenville, S. C. David has received many honors during his first three years here at Clemson.

David is a member of the Clemson R.O.T.C. unit in which he has served as Cadet M/Sgt. and is presently a company commander with the rank of Cdt. Captain. David was recently awarded the Distinguished Military Student medal which is one of the highest honors that can be given in the Cadet program.

He is also a member of the Clemson Chapter of Phi Psi, and this year is president of the Clemson Chapter of N.T.M.S. He was awarded the Textron Foundation Scholarship for the period of 1954-1958. This scholarship pays $500 per year to the holder.

Robert E. Foster, Jr., better known around the campus as "Bob", is a Textile Manufacturing major from Union, S. C. Bob has gained valuable experience working with the Excelsior Mill in Union where he has been employed by the Finishing and Industrial Engineering Departments for the past five summers. As well as experience, Bob has used his summer work to pay part of his expenses here at Clemson. He received honors the activities include his membership in the Clemson Chapter of N.T.M.S. Bob is also enlisted in the Army Reserve Program and a member of one of the local units.

Henry E. (Jack) Jennings, is a Textile Manufacturing Senior from Newberry, S. C. He and his wife are presently making their home here at Clemson.

Jack has been working during the summers to pay part of his school expenses and has worked one summer at the Oakland Plant of Kendall Division. He has served four years in the Navy.

His activities include membership in S.A.M., the Society for the Advancement of Management, and also in the Clemson Chapter of Phi Psi. Jack is also a member of the staff of THE BOBBIN & BEAKER and is presently Business Manager. He received honors both semesters of his Sophomore and Junior years.

Looking at Fibers with X-rays

By
Dr. A. N. J. Heyn
Professor of Natural and Synthetic Fibers
School of Textiles
Clemson College, Clemson, S. C.

This article is a second one in the series on fiber structure by Dr. A. N. J. Heyn. The first article appeared in the fall, 1955 issue.

The most important physical properties of textile fibers such as strength, elongation, density, water and dyestuff absorption directly depend on the molecular structure. This structure is too fine for being directly seen with the light microscope being revealed by the visible light, which is too "coarse" for this purpose. In order to resolve particles of atomic dimensions, radiation of much smaller wave length than that of the visible light must be implored; electron beams or x-rays are suitable. The best method for studying atomic structures is, at the present time, the x-ray method, which is described in the present article.

X-rays are similar in nature as ordinary light, the only difference is that their wave length is about 10,000 times shorter. The x-ray method differs from light and electron microscopy in the following point: In light and electron microscopy, the radiation scattered by the sample is re-united by a lens system to form an **enlarged image** of the structure. In the x-ray method this last step is omitted; instead of looking at an image, **one looks here directly at this radiation itself.** This is necessary because no lenses exist yet which can refract x-rays to form an image. A model of the structure corresponding to an image, however, can be reconstructed by mathematical methods from this distribution of radiation. Scientists are working now to construct a **real x-ray microscope** in which special curved mirrors form an image just as the light microscope does with visible light, but this instrument has not yet been realized, so far, so that the laborious method of mathematical reconstruction has to be followed if one wants a complete model of the structure.

Such mathematical treatment, however, is by no means always necessary in order to make conclusions. On the contrary, in most cases important conclusions can be readily read directly from the diagram, if one knows the underlying principles.

The way in which a fiber is investigated with x-rays is illustrated by Fig. 1. (a) represents the x-ray tube, (b) a set of pinholes to obtain a fine x-ray beam (primary beam) which irradiates the fiber, (c) mounted in front of the pinhole system, perpendicular to the direction of the beam; a photographic film is placed at (d).

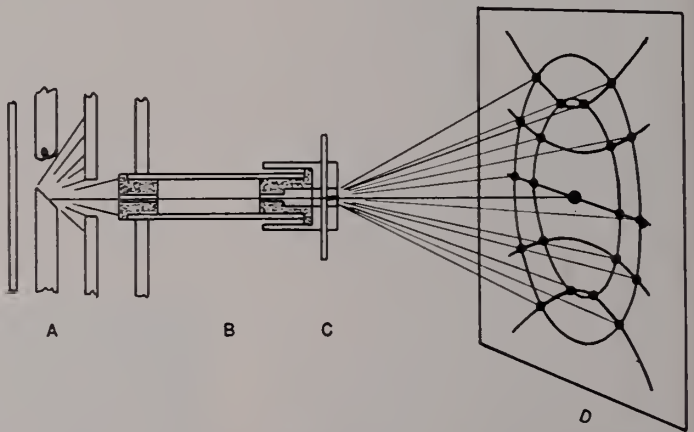

Figure 1. Arrangement for x-ray investigation of fibers. (a) x-ray tube, (b) pinhole assembly, (c) photographic film. The x-ray diffraction spots lie on the inner sections of a set of concentric circles and hyperbolas.

When the beam of x-rays strikes the fiber, some of the energy is absorbed and then re-radiated. If the atoms in the fiber have no particular order, the irradiated waves scatter haphazardly, but if the atoms are organized in crystalline form, reflection of part of the x-rays in very definite directions takes place. This reflection occurs on the internal structures of the fiber, almost in the same way in which visible light is reflected by mirrors. The mirrors are, in this case, the crystalline planes in which the molecules of the fiber are arranged.

Figures 2 illustrates how the atoms or molecules of the crystalline areas of the fiber are lying in regularly spaced and recurring planes. If these planes are in the proper position to the incident x-ray beam part of the radiation is reflected in (Fig. 3), so that an exposed spot will be found on the photographic film behind the fiber. The composite of such spots form the characteristic **x-ray diagram or diffraction pattern of the fiber.** From the location of the spots on the film it is possible either to establish the complete structure of a crystalline material, locating the posi-

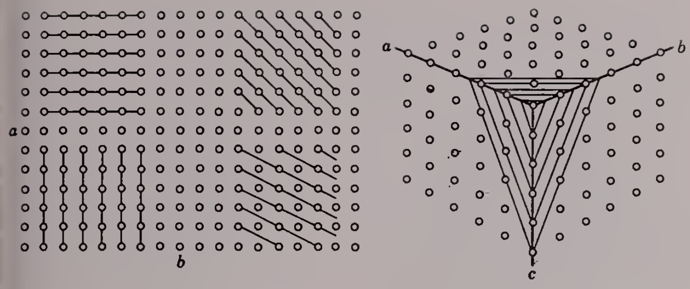

Figure 2. Lattice planes in which the atoms of a crystal are arranged. The small circles indicate the atoms or molecules in the crystal lattice.

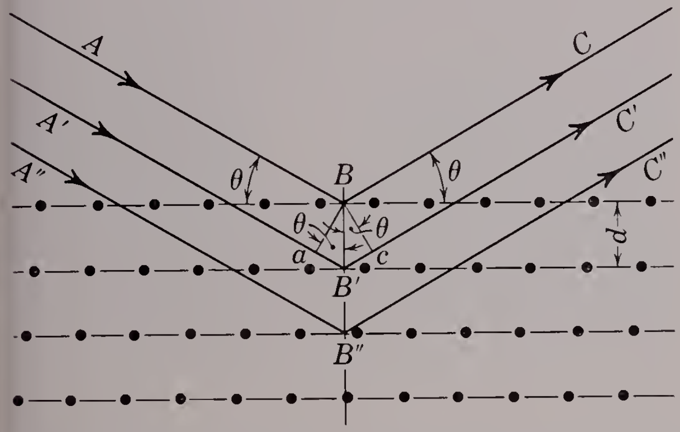

Figure 3. Refraction of an x-ray bundle, A, B, C; A', B', C'; A'', B'', C'', on a set of lattice planes. The angle of incidence, O, equals the angle of refraction.

tions with respects to one another, or to make some special, quick conclusions about certain questions regarding the structure.

If a substance is non-crystalline or amorphous, no special diffraction spots will be found; it can be immediately seen, therefore, whether or not a substance has crystalline structure.

The diagram of a fiber or an oriented high polymer in general is characteristic in that it is symmetrical with regard to the meridian and equatorial lines. Figure 4 is the diagram of a highly oriented cellulose fiber, hamie, it consists of distinct diffraction spots. Figure 5 (a) is the diagram of a nylon before cold drawing in which state the molecules have random orientation, and Figure (b), after cold drawing, in which state the molecules are highly oriented parallel to the longitudal axis of the fiber. Diagram (a) of the oriented fiber consists of a set of concentric rings, whereas, the diagram (b) of the oriented fiber, shows distinct diffraction spots which are very intensive on the equator.

The diagram of cotton (Figure 6) is about intermediary between the diagram (a) and (b) of nylon, in that it shows arcs. This can be explained by the spiral structure of cotton in which the microcrystallites have preferent orientation, a state which is intermediary between random and perfect orientation.

The Bureau of Plant Industries has carried out extensive investigation on x-ray **diagrams of cotton** and found that the extent of the arcs varies in different varieties and indicates a different spiral structure in these cottons. It was found that this feature is directly correlated with the strength of the fiber and therefore is of great importance in cotton breeding. The x-ray method has therefore been extensively used by experts in agriculture and has lately been adopted in cotton testing. The bureau of plant industries has standardized the method so that any technician can rapidly carry out the x-ray examination.

Another example of the use of the x-ray method for quick solving of specific questions is the study of **chemical modification** of cotton. An example is mercerization. Since native and mercerized cellulose have different x-ray diagrams it can be directly seen from the x-ray picture.

Since each fiber has a different diagram, it will be very easy to distinguish and **recognize different natural and synthetic fibers directly from their x-ray diagrams** by comparison with a standard diagram.

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A well-known application in rayon industries is the determination of the **proportion of the crystalline and non-crystalline components** from the x-ray diagram of the fiber; this quality determines many fiber properties.

The great importance even of the simplified x-ray method for the study of fibers will be clear from the above examples. At the present time, the synthetic fiber and rayon industries recognize the use of x-rays as one of the most important proofs in the evaluation of their products. It appears that this method, originated in basic research, is more and more being used in the applied field of fiber testing, and quality control.

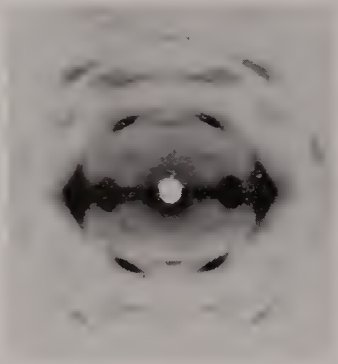

Figure 4. X-ray diagram of ramie fiber.

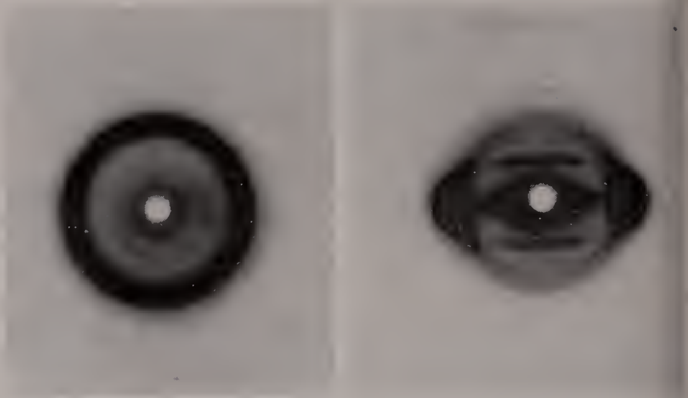

Figure 5. X-ray diagram of nylon, (a) before cold drawing, (b) after cold drawing.

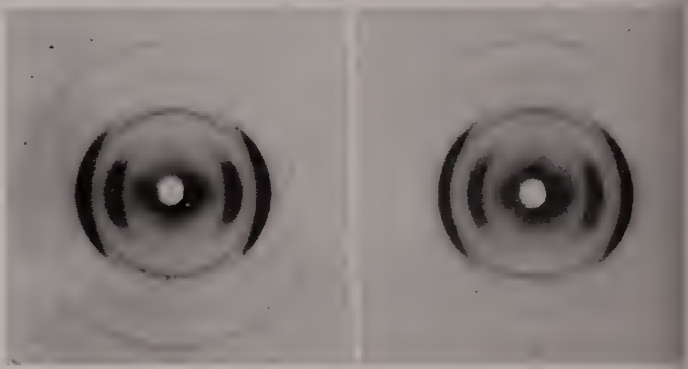

Figure 6. X-ray diagram of Upland cotton. (a) "Empire" x-ray angle 32°, and (b) variety Coker, 100 wilt, x-ray angle 44.2°.

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A Study of Warp and Filling Ondule

By
W. E. Tarrant, Associate Professor
Weaving & Designing Department
School of Textiles

Specific Objectives: 1. To produce filling ondule from one beam using a new and simpler method. 2. To produce warp ondule from one beam without using special reeds and complicated attachments.

Reason for Project: According to some magazines and books, the added high cost of attachments prevents ondule from being produced in this country. The demand has been small and uncertain but I feel that the fabrics can be made cheaply and promoted for use in summer clothing and window curtains.

J. H. Strong, in his book on Fabric Structure, has this to say: "Weftway ondule has not been used to the extent it might be. The warp-way ondule is not produced on a large scale, but the dictates of fashion may bring it into favor at any time."

Definition: "Ondule—a weaving term derived from the French word onduler meaning to wave." Ondule is a plain weave fabric in which either the warp or the filling weaves out of line while weaving in a relative normal plane.

Background: The ondule principle is not of recent origin, similar goods having been made to some extent in the early 19th century. Filling ondule fabrics are of more recent origin than warp ondule fabrics. Ondule is placed in the novelty class as production is limited in cotton goods by several factors among which are: (1) costly loom attachments, (2) small and uncertain demand. In the early thirties, some New England mills manufactured ondule fabrics but the consumers refused to pay the high price and production was soon abandoned.

Filling Ondule: In this plain weave fabric, the warp is woven in a straight line and the filling is waved, or woven out of line. This is accomplished by varying the tension on the warp threads which in turn causes the picks per inch to vary in a warpwise direction. The method used and the manner in which it is used can produce three different types of filling ondule. Sample A consists of the thick and thin spot type made by varying the tension on a few ends ever so often in the cloth. Sample B is an over all effect type, made by varying the tension on adjacent groups of warp ends in alternating, or plain weave order. In sample C, the filling is waved with no thin spots. This is made by using less tension and releasing the tension more gradually.

Filling Ondule Effect in Cloth: I found that I could vary the tension on a group of ends and produce filling ondule from one beam. Referring again to samples A and B on page 5. What causes the thick spot or place? What causes the thin place? With the loom running—first, I pulled a group of ends up quickly between the drop wires and whip roll. This pulled the picks back out of line at the fell of the cloth. Second, I held the group of ends up for six picks which allowed those six picks to beat up out of line since they were back of the fell. This made the thick place —more picks to inch. Third, I released the group of ends quickly and the warp ends and picks went forward beyond the fell of the cloth. And this made the thin place when the next few picks were put in the cloth. Repeating, the method is to pull the ends up quickly, hold them for several picks, and release them quickly. Pulling the ends up quickly and holding them up for several picks gives a thick place. Releasing the ends quickly gives a good thin spot. If you release the tension on the ends gradually you may not get a thin spot at all. The number of picks the group of ends is held up will depend on the tension of the warp and prominence of the spot wanted usually holding the ends up for two picks will not give a thick and thin place. This method appears to be different and simpler than the previous methods used. The next step was to find the best and simplest place to work it and how.

List of Places and Methods Tried or Considered:

1. At the fell of the cloth—pushing down on the cloth and releasing quickly produced irregular filling ondule. Objections: (1) could not control a definite number of ends every pick. (2) the temples were in the way.
2. Between fell of cloth and harness—a side pull—or upward pull—using various things. Objections: (1) anything here would interfere with shuttle and shed. (2) would be in the way of the weaver drawing threads. Exception, an ondule reed which is described on page 17. Perfected but not used.

3. Between drop wires and harness (a) a back harness with vertical bars—moving sidewise. Objections: (1) this would crowd the ends and since the opening position for the threads has to be held for several picks this would interfere with the ends changing position in the shed. (2) the pull would be too great to get the desired size spot. (b) a group of ends drawn thru two sets of harness. Back harness to give the extra tension only. This seemed to be a good idea. It had been done but not used. Why? I guess that the end breakage was too great — as the article said: "Some ends in the groups have a greater tension than others."

4. Between drop wires and whip roll. (a) a bar with vertical pins moving horizontal. Objection: (1) would crowd ends at the drop wires for several picks. (2) Too much pull to get the correct size spot. (b) two bars, odd group of ends over one bar and even group over the other. Moving up holding for several picks, and releasing quickly. Looked O. K. if bars could be worked from dobby. Objection: An extra bar would have to be used to pull the ends against to tighten them quickly. My type 3 opener is like this method.

5. Between whip roll and beam. (a) two bars pulling back on groups of warp ends—alternate pulls. Objection: (1) would be out in alley, (2) or would be in the way of a full beam. (b) Do away with whip roll and have two back rests—which could move back and tighten the groups of warp ends alternately. This had been tried but not used. Reason: Probably (1) due to variation in tension. (2) required too many adjustments. (3) too long a distance to tighten ends — beam to drop wires. (4) variable distance from full to empty beam—uneven spots—It appears that the best place to operate a device for making filling ondule will be between drop wires and whip roll.

What device to use? Although I am convinced the above place is the best place to work a device, I am considering other places and methods as they come to my mind. Hence, the following things are in no definite order.

1. Two leno type slackness—objections—(1) will not work using one beam as drop wires will stop loom when yarn slackens, (2) will be in the way.

2. Two leno type slackness—worked in reverse—to tighten yarn then slacken. Objections: (1) takes takes too much space—in the way, (2) leverage too great.

3. Easier bars—like those for leno when slackners are not used. It has been tried. Objections: according to book (1) spots are uneven, (2) has to be adjusted to a "nicety" and kept in good shape, (3) too much checking and resetting.

4. Whip roll on loom with two back rests. Odd groups of ends over one rest even groups of ends over other rest. Objection—too much pull (2) in the way.

5. Rubber hose with core, spiraled around revolving whip roll. This makes wavy filling ondule but not the spot type. I tried this with a one half inch hose and the ends slipped off. I even put pegs varied, although the pegs were the same distance apart. The cloth was ragged. According to Textile Industries magazine, April, 1955, this has been done. My hose was too large for the diameter of whip roll used. Since I was interested in making the spot type filling ondule, I put off the making of waved type to a later date.

6. Rope around a moving whip roll—about the same as No. 5.

7. Half of garden hose around a revolving whip roll. About the same as No 5.

8. Two whip rolls, alternate groups of ends over each. About the same as No. 4.

9. Sectional reeds — sections moved backward or forward. Bennett in his book entitled "A Cotton Glossary" gives this method, but I did not find out about it until after I had spent much time thinking about it. This probably gives a line in the cloth at the beginning of each section.

10. A non-moving sectional reed—used with a raising and lowering false reed—this has been done. See Bennetts' Book.

11. Concave and convex reed used with false reed—has been done. See reference page 17.

12. Pull rolls — one pulls up, one pulls down, two rolls per spot. Objection—too much rigging.

13. Two oscillating rolls worked up and down by cams or eccentrics. Two cams to a roll. Four cams to weave two spots. Works but too much rigging. This has been made.

14. High reed—two sections—dividing line in center. Lower half of one section concave, upper half straight, or convex. —next section just the opposite. A similar reed has been made. Objections—(1) has to work up and down and have a false reed to guide the shuttle.

15. Float or pull bars—working in racks, at each end. Pull down by springs, pulled up by dobby. Objections: (1) too much rigging, (2) not supported in center. Will buck and spots will be uneven.

16. Embossed whip roll—waved ondule probably—

trouble, each raised part will not pick up the same number ends.

17. Spiral grooved whip roll covering—waved ondule. Grooves will have to conform to diameter of revolving whip roll, or else slack yarn will stop off loom.
18. Notched opener—2½ inch flat wooden bar with notches—the ends in the cut part will not have tension. Objection: Will not pick up same number ends each time.

Devices Built: Three devices were built and operated from the dobby head on a C-6 loom. The samples of cloth are included in this report. I like to call them openers because the idea originated from the old type flat wooden bar that was used to open up the ends on a stuck warp. Type 1 opener consisted of two wooden harness frame bars taken from a regular harness. These were mounted, one above the warp and one under the warp. They were mounted in stands at the ends of the loom where they would be top over bottom. The top opener bar was pivoted at the back edge so that the front edge could move up and put tension on the ends over it. The bottom opener bar was also pivoted at back edge so it could swing down and put tension on the ends under it.

The odd groups of 20 ends were put over the top opener so they could be tightened when opener raised.

The even groups of 20 ends were put under the bottom opener where they could be tightened, when bottom opener was pulled down. Each opener was operated from a separate harness lever and the chain was pegged so that the top opener would be up for six picks, then the bottom opener would be down for six picks. Sample B shows the cloth for this particular type opener. The trouble with this opener was that the bars, or boards, bowed in the middle as they had no center support and the ondule spots were not very good in the center of the cloth. I rigged up the bars where they would operate from both ends, still boards bucked in the center. Finally, this idea was abandoned for type 2. Type 2 opener consisted of two 5/8 inch rods mounted 2 inches above the warp—One about 3 inches in front of the other. These rods were supported by metal stands at each end. On these rods were mounted adjustable "U" shape fingers made out of 1/8 inch steel rods. These fingers were shaped at the bottom where each finger would allow 20 or 30 ends to lay flat on the bottom horizontal part of the "U" shape finger. The openers were connected to the dobby harness levers and the chain was pegged the same as for number one type opener. This type operated fine. The fingers were made adjustable so they could be set to get the same size spot in case the overheads rods bowed. I decided

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this type opener would be all right for weaving a few spots here and there in the cloth, but that another type would have to be developed for the overall effect,—filling ondule—hence, type No. 3.

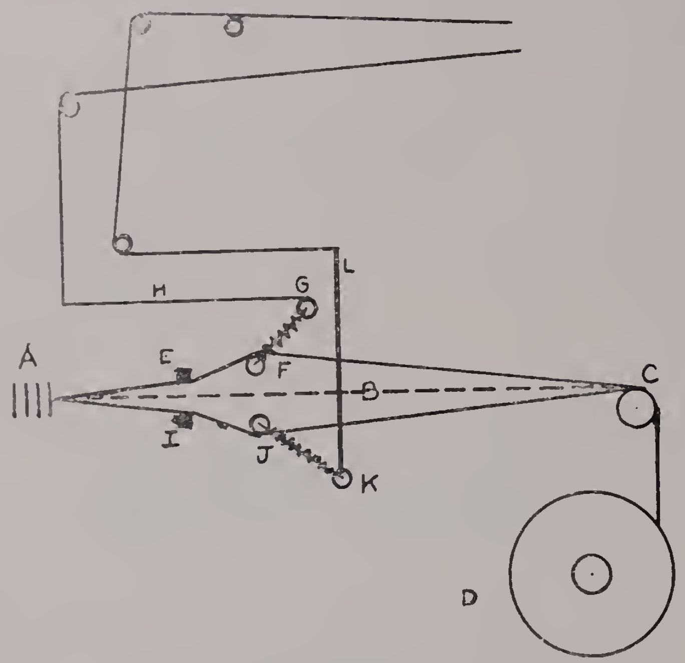

Figure I shows a side view of a filling ondule attachment used on a C-6 Loom. A—drop wires, B—warp line, C—whip roll, D—beam. Odd groups of 20 ends are placed over the pick-up bar F and they take the position of A, E, F, C. Even groups of 20 ends are placed under the bar J and they take the position of A, I, J, C.

Operation of Top Opener: When lever H is pulled up by dobby harness lever, rod G turns in its bearings and causes pick-up rod F to pull the warp ends against a stationary bar E. This position is held for 6 picks in order to make the thick spots in the cloth. Next, the harness lever is lowered and the opener is pulled down by springs. This quick release helps to make the thin spots. When top opener is releasing, the bottom opener is opening—vice versa.

Operation of Bottom Opener: When lever L is pulled forward by dobby, rod K bar I. This position is held for six picks in order for this opener to make the thick spots in the cloth. Next, the harness lever is lowered and the opener is pulled back up by springs. This quick release helps make the thin spots in the cloth.

For type number 3, I used the same stands and the two 5/8 inch rods mounted 2 inches above the warp. Instead of the fingers, a long rod 1/4 inch in diameter was used for each opener. Each rod was fastened to the over head bar by four adjustable fingers—one on each end and the other two spaced to give equal support to the lower part of the opener which pulled the ends up. The main trouble with this opener was that the back bar would pull the front bar up. Instead of building another set of stands and separating the bars more, I placed one opener underneath. This worked satisfactorily after the lower bar was braced in the center. See diagram of this opener in figure 1.

Size of Spots: Length of spots, filling wise, depends on the number of ends used in a group over the opener bar. Height of thick spot depends on the number of picks the ends are held up. Height of thin spot depends on the tension of the ends and a quick release.

Points for Making an Opener: I would suggest working both opener bars above the warp between the drop wires and whip roll. I am sure this can be done for a light constructed fabric. See Bennetts' construction for filling ondule, page 13. To operate both opener bars above the warp, more space may be needed between the opener bars to keep the back bar from interfering with the front bar. To get this space, the whip roll may be moved back and the drop wires moved forward if necessary. Instead of having both bars pulling up from the front edge, it would probably be better to have the back bar pulling up from the back edge of the bar. I would suggest using similar type bars, but larger ones. The large rods two inches above the warp should probably be one inch in diameter or larger. The pick-up rod, the ends go over, should be one-fourth inch or larger. The support rods, connecting the two above rods, should be adjustable in order to get the same pick up of ends due to minor variations. The stands should have bearings for the opener bars to work freely. Each opener bar will need a stationary bar to pull the ends against in order to tighten the ends quickly with a minimum lift of the opener bar. Overhead opener bar. Overhead opener bars may be supported from underneath the loom by a thin strip of hard steel if the bars bow in center. One support for each bar placed near the center should be enough. In connecting up the opener bars to dobby harness levers, use the minimum tension to get the desired spot. The opener bars can be connected to the dobby harness levers in a less complicated manner. I have worked out two ways in which this could be done. The position of the various parts of the opener has a great deal to do with the amount of lifting force needed to give a good ondule spot. I suggest that this force be kept to a minimum to eliminate end breakage and excess strain on dobby. The distance between the pull up bar (bar the ends go over) and the stationary bar (bar the ends pull up against to tighten) should be approximately two inches in order to get the proper tightening quickly. The distance between the front of whip roll and the stationary bar should not be over eight inches as this will also effect the tightening of the ends quickly. See diagram of opener, page 11.

Loom Stops: In using my type opener for weaving filling ondule, I find that the slackening of the ends, in this method, does not cause loom stops. It appears that varying the tension on the ends, in this method, would increase end breakage; but to date, I have had but two ends down in the groups of ends where the tension was varied, and these breaks were due to large slubs.

In regard to this, I quote Mr. Bennett in his book entitled "A Cotton Fabrics Glossary". "Of course good yarn has to be used in making a fabric in this method, but if care be used the tension on the various threads will not be great enough to cause any large amount of breakage." Mr. Bennett was referring to several of the previous methods. I am inclined to believe my device will cause less end breakage than the previous methods, provided it is set up to produce the spots with a minimum tension.

Cam Loom Observations: (1) While experimenting on an X-2 loom, I noticed that I could make just as good filling ondule with half the number ends, every other one, in a group over the opener bar. I assumed the conditions were too extreme and did not spend anytime trying to make it work. If it was possible to do this, the dobby would have less strain on it.

(2) I also noticed with the above "set up" every other end over the opener bar for a group of ends, that the picks could be spaced evenly in groups of two's by working the opener bar every other time. This could lead to a new type cloth.

(3) Next, I noticed with the same "set up", that a line could be made down the center of the filling ondule spots by not putting the two center ends in a group over the opener bar.

Preliminary Work: This work was done on an X-2 loom weaving plain weave. The cloth construction is given under the title, Filling Ondule Cloth Constructions. The work sheets contained about 100 items, samples of cloth, and ideas I tried as to how to make filling ondule. I am not including all these elementary things in this report but they may be obtained. However, I am including the important findings at various places in this report.

Filling Ondule Cloth Constructions: Just one construction was found in reference books. The other two constructions given below are for the looms I experimented on.

(1) Bennett, in his book entitled, "A Cotton Fabric Glossary", gives the following information: "27 inch width cloth, 48 x 48, warp 50/1 combed American cotton mercerized, filling 2/40s sea island cotton. 696 ends bottom beam, including 48 selvage, 648 ends top beam." I feel sure that the warp and filling need not be of such a fine quality to produce filling ondule.

(2) **Information for Cam Loom Experiments:** X-2 loom, plain weave, 44-72 x 40, 30 warp, 22 filling. (I understand from information found in the various books that the filling should be larger than the warp in order to accentuate the effect).

(3) **Information for Dobby Loom Experiments:** C-6 loom, cram stripes—plain weave between stripes,

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cloth 43 inches wide, ground construction: 70 x 58 black warp 20/1, pink warp 30/1, white warp 28/1. Filling 30/1 cotton. This construction was too heavy but I figured if filling ondule could be made between the warp cam stripes for this construction, it could be made using a lighter construction. Also this was the best warp available. Samples A and B were made on a C-6 loom with above construction.

Warp Ondule: In this plain weave fabric, the filling is woven in a straight line and the warp is waved, or woven out of a straight line. Sketch A illustrates how warp ends will be waved out of line. Five beams, with different counts of warp yarns, and a fan shaped reed are needed to produce a cloth like this sketch. The fan shape reed varies the ends per inch in a vertical direction in the cloth. A sectional reed twice the height of an ordinary reed is used. The dents in one section are close together at the bottom and wide apart at the top. The other section is just the reverse. Two sections usually make one repeat, and the number repeats in the reed depends on width loom. The reed is moved up and down slowly to produce the waved effect. In this type of warp ondule, the lines are not very prominent unless colored yarns are used. Sketch B illustrates the other type of warp ondule which has open spaces in the cloth. Here again, the reed is twice the height of an ordinary reed. The principle here is to have diamond open spaces in the reed which weaves the warp ends out of line producing open spaces in the cloth. In one section, the diamond in the reed will be at the bottom with dents just above it straight. In the next section, the diamond will be at the top with the dents just below it straight. The reed is moved up and down slowly to weave the diamond in plain weave motif order. This type ondule requires several beams and leno attachments in order to weave leno around the open spaces in the cloth. The third over all effect type warp ondule has not been made.

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My Objective: To produce the over all effect warp ondule from one beam.

Ideas Limited: I have tried out many things and find that there is just one thing with which to work and that is the reed. Many special type reeds with their complicated attachments for raising and lowering have been made. To date, I see but one way to make the open spot type warp ondule and that is to have something to spread the dents in the reed when the reed beats up. Of course, this is contrary to what should be done. Can it be done? Is it practical?

Ideas Tried: 1. Put vertical wires in at fell of the cloth and beat up pick. Objections: (1) Small wires will not give a wide enough open place. (2) Large wires break the picks. (3) In the way at temples, and when looms slams with shuttle in the cloth. 2. Front harness with fine wires fastened at top of harness—passing down thru small heddle eye, then thru reed, and fastened to a fix rod under cloth. Wires stay in bottom of dent. Harness jumped up at front center so wires would be in center of dent. Harness moved to side at front center to spread dents when warp ends were level in shed. Objections: (1) Front harness too far away from reed. (2) Had to move too far to open up dent. 3. Same as No. 2, except use two harnesses—one wire to each harness, two wires per dent, one harness moving to right and other to left would open dent up better. Objections: Same as for No. 2. 4. Spread dents with drop wires mounted on rod at front and rear top of reed. Drop wires pass thru reed. Drop wires lowered at front center and pulled to side to open dents. Objections: (1) It is too complicated. (2) It is in the way. 5. Pull strings on a bar thru dents in reed, fastened below reed at back bottom. Bar moved to one side spreading dents. Objection: (1) Too complicated. (2) Strings in the way. 6. Punch holes in reed at front center to spread dents —Fiber fingers mounted on rod-stands fix position above fell—fingers swing in opening reed when reed is near fell of cloth. Objections: (1) In the way. (2) Finger will not hit in the same dent. (3) Will ruin reed. 7. Punch fingers, mounted on rod back of reed near top. Fingers bumped in by spring. When reed is near fell of cloth. This was developed. See page 17 device developed. 8. Small vertical rods mounted

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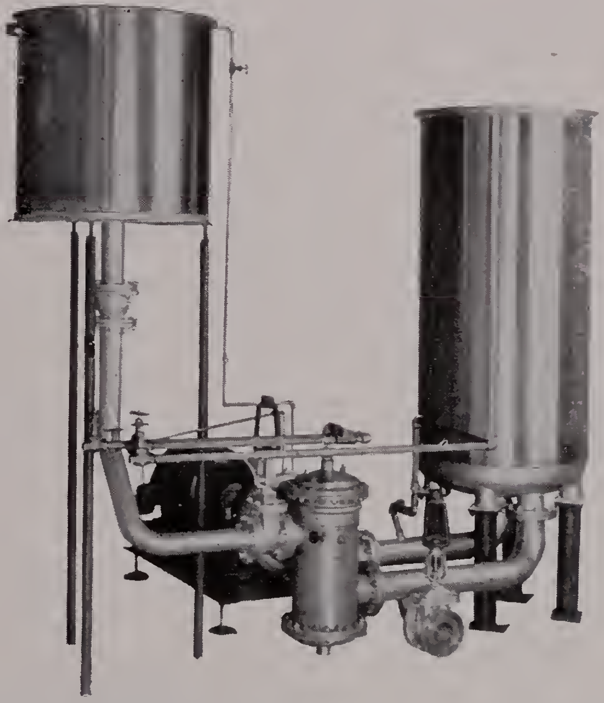

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on horizontal pull rod, rod pulled to side when reed was at front center—forcing ends to spread dents. Objections: (1) This gives filling ondule. (2) Vertical rods in way. (3) Too much pull to get correct spot. 9. A coiled spring with core in center. Back of reed positioned at bottom of reed. Spring in a movable case. Lifting or push rods brought it up on each pick before reed reached fell of cloth. Cords from dobby working around pulleys, running up lay swords, pulled lever to force spring in at fell of cloth. Objection: (1) Type spring used selected the dents, O. K., but did not open up reed enough to make a good spot. 10. Vertical pins working up thru race plate near bottom of reed. When reed is at the fell. Objections: (1) Break picks and ends. (2) Too small to give a good size spot. 11. Reed back of reed—back reed skeleton reed two wires every so often—back reed, moves to one side. Objections: (1) Would make filling ondule. (2) Too much movement required. 12. Fine wires fastened to rod under cloth. Two wires thru a dent—fastened to two pull bars at back bottom of reed—wires stay in bottom of dent—move up when reed is at fell of cloth. One rod pulls to right, other to left, and opens up dent. This looks possible. Objections: (1) Wires and reed wear out. (2) Wires would have to be very small and strong. 13. Pull barbs at top, front, of reed—light weight hard plastic cone shape barbs with fine points. Point of cone toward reed. A small wire goes thru each barb. The front end of the wire fastened to a light horizontal wire which rests on top part of shed. The top part of shed raises and lowers these barbs every pick. The fine wire thru the barb passes thru a dent and is fastened to a pull rod at top, back, part of reed. The pull rod is connected to dobby harness lever which causes the barbs to be pulled into the reed as reed approaches the fell of the cloth.

Device Developed: Sharp pointed brass conical fingers were used to spread the dents and produce warp ondule. These adjustable fingers were mounted on a movable rod at the top of the reed on the back side. A spring bumped the fingers into the reed, opening up the dents, just before the fell of cloth was reached by the reed. The dobby harness chain was pegged to raise a lever to prevent the spring from bumping the fingers when no spots were wanted. Objections: (1) The fingers did not open up the reed far enough to get a good size spot. (2) Fingers did not hit in same dent every time. (3) Fingers damaged the dents when made to open up wider.

Reference on Filling Ondule Methods: Bennett, in his book entitled, "A Cotton Fabric Glossary", page 593, gives four ways in which filling ondule has been made. 1. Using an ondule reed. This reed is twice the height of an ordinary reed. One section is concave at bottom and convex at the top. The next section is just the opposite. All the dents are uniformly spaces. This reed is moved up and down slowly to get the filling ondule effect. A false reed has to come into place to guide the shuttle. 2. Another type of sectional ondule reed, where a section is made fast on one end and loose on the other so it can swing backward. A section may contain as little as three dents. An engraved or grooved roller is made to change the position of the sections. (3) A unique method is to have two sets of harnesses—front and back. The ends are drawn thru boths sets. Four back harnesses are arranged at different heights and bound together tightly.—(Probably 4 back harnesses for each spot). The four back harnesses are raised and lowered slowly as a unit. Objection: The highest harness in a unit gives a greater tension than the lowest harness. 4. Two easier bars on slackners, like for leno. Quote, "Two beams used, probably one could be used—not as good as using an ondule reed. It cannot be depended on. Cloth spots not prominent, have to be adjusted to a "nicety." Also has to be adjusted often and kept in good shape."

Nesbitt in his book entitled "Grammar of Textile Design," page 258, gives a sectional reed just like the first one described by Bennett. He also gives a method where two oscillating bars slowly move in opposite directions—operated by cams or eccentrics. Two warp beams used—thinks one could be used.
Strong gives the following method in "Fabric Structure", p. 212. Movable back rests—moving away from heddles and back, alternately.

References on Warp Ondule Methods:

Bennett. "A Cotton Fabric Glossary", page 593. A fan shape sectional reed.

Nesbitt. "Grammar of Textile Design", page 258, gives three types of ondule reeds: Number 1. Lower 1/3 of reed has dents sloped to give a "V" shape with half diamond open spaces between sections. Upper 2/3 or reed dents are straight. Number 2. Dents are angle to give open inverted "V" from top to bottom —ever so often. Number 3. A fan shape reed like Bennett's No. 1.

Strong: "Fabric Structure", p. 212, gives a fan shape reed like the one described by Bennett.

Textile World Magazine. April 30, 1932. Ondule reed —reed twice height of ordinary reed. Wires straight except where open space diamonds are formed in reed. One diamond or open space at bottom of reed —20 dents over another diamond at the top. This reed like all the other warp ondule reeds has to be moved up and down slowly.

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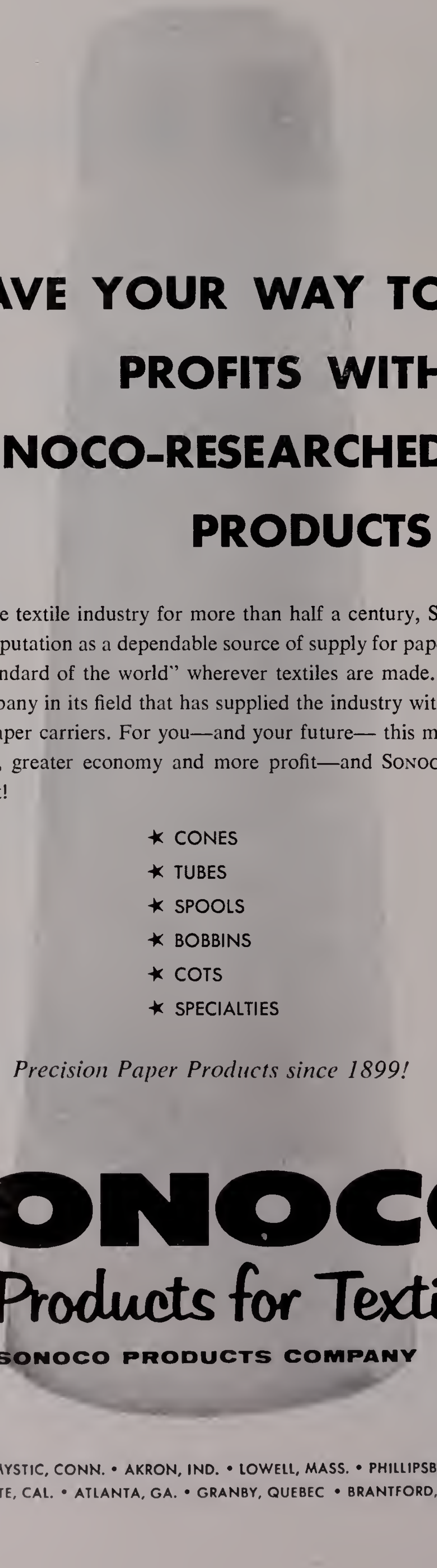

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Guest Article

DECISIONS

by

W. W. Pate, Jr.
Vice President
Wunda Weve Carpet Co.

If you're looking for responsibility and a chance to exert your own individuality, there's a place for you in the textile industry. If it's challenge you want, it's rampant right now in every phase of textile activity. But if the pessimistic headlines of the current business and trade journals scare you, summon up enough courage to change your curriculum.

Although the production of carpet should correctly be considered in a category of its own, we certainly have a constant liaison with the general textile industry, and are affected by the same factors which influence all segments of the industry.

It's time for us to come out of our cocoons and realize that we have a battle to wage. Many of our policy makers have predicated their thinking on the belief that the textile products are so basic to our economy that they have to succeed. During days of increasing demand, this may be true; however, when money tightens and consumer purchases are made more carefully, we find ourselves in competition with everyone from automobile and appliance manufacturers to yo-yo distributors.

At this moment in the history of our business, there are too many mills for the amount of merchandising and marketing being accomplished. The future will be determined by our ability to convince customers of the advantages of the products made by the textile industry. The record to date is spotty, to say the least. Therefore, anyone intending to pursue a career in textiles should carefully evaluate their own ability and determine if they really have ideas and ideals and are willing to stick by them. If your answer is affirmative, this industry needs you vitally.

We were able to break into the century-old carpet business twelve years ago, and have succeeded in establishing reasonable demand for our product in a relatively short period because the policies of the floor covering world were clouded with old-hat production and merchandising techniques. In 1945, almost all the carpet manufactured in the United States was made by eighteen companies, and over 90% was constructed from wool or animal fibres. The business was sufficient for all and consequently no emphasis was placed on research and development.

They were stagnant when they should have been searching.

Today at least one third of all the carpet produced is by companies not in existance at the end of World War II, and wool accounts for no more than 50% of total production. New techniques of production deserve a share of the credit for this change. For example—tufting, the process of multi-needle sewing used primarily to make bedspreads and quilted robes, was transferred to the manufacture of carpet. This method substantially cut labor costs over loom weaving, even though some quality would be sacrificed.

We considered the quality factor as too precious, and took another route. We were aware that upholstery manufacturers in this country and some weavers in Europe had successfully conducted double plush weaving on certain types of goods; however, no-one had successfully applied the idea to carpet weaving. We decided to try. It took a tedious three years of trials and failures, and then it worked!

This initial investment in experimentation resulted in our ability to weave two 12' or 15' rolls of carpet simultaneously. Almost instantly, we were able to double our production with the same work effort; and more important, we had the first real improvement in carpet weaving in a hundred years.

This certainly improved our competitive position production-wise; however, we still had a lot of convincing to do in order to gain sales acceptance for our carpet, so we turned our attention to the marketing procedures of the floor covering field.

We became increasingly aware that many of the quality department stores were distressed by the fact that the giants of the carpet industry offered little protection to their dealers, and in some cases, were selling to hardware stores and gasoline filling stations. This seemed rather naive to us, so we strengthened our selective dealership policy, strictly limiting the number of accounts we would serve, and were able to persuade the best known and respected stores throughout the country to become Wunda Weve dealers. This step added a great deal of prestige to our product.

Our next move was to develop the first cooperative advertising program to be offered in our industry. This enhanced our position with the aggressive minded merchants and soon forced compliance by some of our competitors.

Selling itself, the key to continued success for competitive companies, required patient study and intention. As a stimulant, we brought into the floor covering field top sales representatives from other endeavors and simultaneously introduced planned selling. This program, which we still pursue, includes careful observance of a dealer's inventory so he is continually displaying the fastest moving lines in an attractive fashion. The salesmen communicate this information to our mill daily so we are also producing the rapidly moving merchandise instead of building up huge investments in inventory.

These have been examples of moments in our humble history which have required definite action. Naturally, there are many times when the best course is more conservative and requires a "wait and see" attitude. One of our most important decisions fell into this category. As you can imagine, all manufacturers of carpet have been besieged in the last several years by the producers of the new "miracle" fibres. It was tempting not to initiate immediate production of these fibres, particularly when we were offered a potent advertising and promotional program by the producing company. However, we knew that over a long period of time, it was more important to maintain a complaint-free product. Otherwise, we couldn't insure proper maintenance and prestige. Therefore, we set an important precedent to which we still cling tenaciously. We have refused time after time to jump on the "promotional wagon" for a new testtube fibre.

Instead, we have emphasized three tried and proven fibres in our lines of carpet. They are cotton, which still offers the most for the money to the American consumer; nylon, the oldest and mightiest of the man-made fibres; and wool, the traditional, classic carpet fibre. Our entrance into nylon came after a comprehensive testing program. We have been experimenting and developing wool and wool blends for nearly five years. It wasn't until late in 1957 that we were satisfied that we had wool carpet which would have the distinctive finish and qualities comparable to those we would be able to achieve in both cotton and nylon. We could have marketed our wool much sooner, which would have added a substantial percentage to our year-end statements. However, again we felt it was imperative that our product be capable of maintaining and possibly advancing our reputation for quality.

I believe that these examples of problem solving are applicable to other companies throughout the textile industry. I have used our company simply because it's my source of primary knowledge, and because the problems we have faced in our first 12 years are analogous to the general industry and may be representative of the situations you will face as an individual planning a career in textiles.

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Mills to Battle U. S. Policies

by
Don Oberdorfer
Observer Staff Writer

The cotton textile industry, beset by lean years, has hung a "Made in Washington" label on its troubles.

The coming year will see intensive efforts to solve those problems in the halls of Congress. The spindles and looms in the Carolinas may dance to the result.

It may be true, as Fortune Magazine once said, that the textile industry is "the last uncleared jungle of free enterprise."

But the textile men have been looking around them in the jungle since the drums of adversity began beating about two years ago. And they find government brambles everywhere.

'Intolerable' Policy

The biggest one is the "intolerable" government cotton policy, to use the adjective of L. G. Hardman, Jr., president of the American Cotton Manufacturers Institute.

About 50 per cent of the ultimate cost of most cotton textile products goes for purchases of the fluffy raw material.

The textile industry needs plenty of cotton, much of it good quality, at what it calls "competitive" prices.

Under the government agricultural program, the industry is now getting scarce cotton, particularly scarce in the better grades, at high government-supported prices.

The last bitter lump in this boll of trouble is that the local industry's competitors overseas are buying American cotton from the U. S. government at special low cut-rate prices.

Drastic changes in the cotton policy are top goals for the textile manufacturers this year.

C. A. Cannon of Cannon Mills, chairman of the ACMI's cotton policy committee, advocates increased U. S. production with a single "competitive" price for both U. S. and overseas mills.

The textile men acknowledge that something must be done for the cotton farmer. The "something" would probably be direct subsidy payments in the much-maligned Brannan plan several years ago.

Direct Pay Plan

Under this system, the farmer would sell his bale of cotton to the mill at market prices, then receive a direct government payment to bring the total return on the bale up to some agreed-upon government level.

Another government-inspired trouble, as the textile manufacturers see it, is the threat of foreign imports slopping across lowered American tariff walls.

Textile area congressmen are fast dropping their traditional Southern "free trade" policies for the shelter of textile protectionism. There is sure to be a battle royal in Congress over President Eisenhower's plan to extend the tariff-cutting Reciprocal Trade Pact for five years.

The government has aided the textile industry by securing Japanese agreement to a voluntary limit on textile shipments from Tokyo to the U. S. department stores. So far, the Japanese have kept their word on the voluntary agreement, but U. S. Textile men would like a rigid U. S. textile import quota substituted for the Japanese courtesy.

Another less publicized textile industry woe, from the manufacturers view, is the government tax policy on textile machine depreciation.

The mills must take 25 years to charge off the investment for new machinery, although they are often economically obsolute in about 10 years. The textile men demand a change.

Machines Cut Costs

The new machinery is vitally important to them because it represents the only practical way of cutting costs. The minimum wage (again a Washington product) and the threat of unionism act as a floor under wages.

But new machines can do less than fewer workers. One big Carolinas spinning firm cut employment 10 to 15 per cent in the last three years, without cutting production a bit!

Though there have been charges of a textile "stretch-out" (workers doing more actual work without increased pay), management experts say most of the widespread progress is due to the use of new machines that do everything but talk.

A more liberal depreciation policy would make financing the new machines much easier.

The Department of Research

by
W. T. Rainey, Jr., Head
Department of Textile Research

As indicated in recent news releases, the School of Textiles has established a Department of Research to coordinate the research activities in the School.

In the past, some fundamental research has been carried out in the School, financed mainly by the academic budget, Kress funds and the Sirrine Foundation. However, the major portion of the research has been developmental or applied research financed by industries on a contract basis. The contracts have ranged from several years duration, involving up to $20,000.00, to small, short-term projects. In many cases industries have been assisted with small problems which would not warrant research contracts, but, nevertheless, were important to the industries concerned.

It is proposed for the future that all research activities of the School be coordinated in the Department of Research with the main interest at present resting in sponsored research. It will be the responsibility of the Department to assist in obtaining and to administer the research contracts. In most cases the contracts will be for work desired and specified by the contracting organization. However, projects, originating in the School of Textiles, may be of sufficient interest to one or a group of industries to warrant the Department's request of sponsorship by those concerns. The contracts may be open-end or for specified time or funds. In some problems involving mainly processing it is possible to estimate the total cost, but in others research could be carried out almost indefinitely. In the latter type on open-end contract is usually more satisfactory, since the industry can continue sponsorship until the desired results are obtained.

Funds of the Department are to be used to finance fundamental research and research of applied nature when no sponsor is available, if such research is of interest to the School or industry in general. Funds will naturally be used for purchase of equipment necessary in research, and such equipment will be available for instructional use also. It is proposed that all equipment in the School be used jointly by research and academic personnel, realizing that the primary purpose of the School is educational.

It is felt that the Department of Research will be of value to the educational program in several ways. As mentioned previously, the purchase of new equipment by the Department of Research would help the academic program to keep abreast of the times without expenditure of academic funds. It is hoped that students, in particular graduate students, can be used part time in the research program, as a means of supplementing income as well as developing research experience. In addition it should be possible for graduate students to carry out their thesis research under sponsorship of the Department. Certainly one intangible but valuable result of increased research endeavor should be development of a research atmosphere in the School. If the training of students takes place under such conditions, they should be much more valuable to the industry in their every-day jobs. As frequently pointed out, an inquisitive mind is more valuable than one trained in a set pattern.

The personnel of the Department are to be full-time, permanent employees. This is certainly necessary if research is to be accomplished efficiently, and economically. The faculty of the School of Textiles (and other Schools of the College) will be used as consultants and part-time employees when necessary or advisable. However, it will be necessary to maintain a staff of technicians for the routine processing and testing work. Research can not be carried out satisfactorily when routine work consumes the time of professionally trained personnel.

As pointed out in an editorial in **The Greenville News** of January 22, 1957, research is the key to the future of textiles. Those firms which stress research as an investment, not just another expense, are the leaders in the field. In the United States during 1957 slightly over $7 billion was spent on research. This means that the average big business spends almost 2% of its gross sales on research. In some industries, particularly chemical, the expenditure for research often reaches 7% of gross sales.

To those familiar with the textile industry the impossibility of such expenditures is apparent. If profits of an organization amount to only 2% of gross sales, research expenditures must be low. It has been estimated that the textile industry spent last year only 0. 1% of gross sales on research. This amounted to about $15 million or only ¼ of 1% of the total research expenditure in the United States.

In the past few years of lowered profits it has become apparent that many textile organizations have felt that research was an unnecessary expense. Several organizations have disbanded or cut back their research groups in attempts to cut down costs. One of the prerequisites of a research mind is that the answer to the problem is the important point, not the dollars and cents available today as a result of the research. No one is naive enough to believe that an industry will engage in research with no hope of monetary return in the future, but all should realize that the acquisition of knowledge from research will lead to a better industry eventually if not now.

What would be the state of the atomic energy program today if millions had not been spent on fundamental research with no foreseeable profit at the time? Would the transistor and other electronic marvels have been developed without tremendous effort in the research lab with no profits in sight? It is a bit difficult to understand how our industry can improve its position without a more determined research effort.

Certainly one of the major reasons for organizing the Department of Research is to increase the research opportunities for the industry. Since many of the textile organizations are small and are unable to finance research staffs, much of the research must be left to the educational institutions and research organizations. It is posible to carry out research more economically in a research organization than in a mill, and, in many cases, the necessary diverse training is not available in the mill even if the money is.

As has been proven elsewhere, one of the most economical methods for carrying out research is in cooperative contracts. This type contract should be encouraged in the industry. If several mills jointly sponsor a research contract, all will profit from the results but none will bear a large financial burden. The textile organizations should be interested in upgrading the industry as a whole. Certainly competition between organizations is an essential in our form of business, but this competition should not be such that the industry suffers. The industry as a whole should profit from such cooperative research efforts.

The School of Textiles is interested in improvement of textiles in the nation-wide economy, and, therefore, will encourage research of both fundamental and applied nature. With the realization that research is necessary for a continuing industry and that many textile organizations are unable to support research facilities or personnel, the Department of Research should be able to render service to the industry as well as improve the quality of instruction in the School.

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Causes and Detection of Damage in Raw Cotton vs Damage by Tar Contamination

Dr. A. N. J. Heyn, Professor of Natural and Synthetic Fibers
School of Textiles, Clemson, S. C.

Previous articles, Numbers 1-4, dealt with damage in raw cotton caused by the action of microbes. The present article deals with a chemical damage; namely contamination by tar spots.

In August, 1954, data were collected by the author of this article from thirty mills in South Carolina concerning the occurrence and importance of various types of damage to raw cotton under normal conditions in the mill. Of thirty mills, twenty three reported damage by tar and oil spots and indicated that they considered this damage as very serious.

In the following years the author received many samples of cotton and cotton cloth for examination, which were found to be damaged by tar. This type of damage is apparently quite general in the State. An important conclusion which followed from this survey, is that the presence of a small amount of contaminated cotton in a bale is greatly multiplied during processing, especially in the carding process. During this stage of the manufacturing process, the contaminated cotton fiber and tar particles are widely spread out and distributed over a large portion of the uncontaminated cotton. In later stages of processing, especially in hot calendering ,fine particles of tar, which would be harmless as such, can develop into larger spots by a diffusion process. Microscopic investigation showed that the tar spreads over the surface of the fiber in close relation with the cuticle. This explains the excessive effect, which a slight contamination by tar may have.

With the introduction of new finishes of cotton apparel, such as; embossing, polishing, and glazing, the tar spot problem has still become more widely recognized and troublesome in recent years. The following survey may be useful in connection with this problem.

Historical—Tar spots in cotton have been reported in literature since 1939. The occurrence of tar spots has probably increased from that year until 1948, in which year various investigations were undertaken, especially by the National Cotton Council. The cause of the trouble at that time was universally ascribed to the coating of bale ties with tar. As a result of these findings, this coating practice was generally abolished and a substantial reduction of the tar spots actually resulted and the problem appeared solved. In 1950, however, a recurrence of tar spots was reported throughout the industry. Since clean banded cotton bales had been universally adopted, new causes apaprently played a part.

Source—A systematic investigation of the origin of the new tar spots was published by Mangum and Buck of the National Cotton Council in 1952, as a result of the cooperative study with twenty mills. Their most important finding was that the exterior tar spot concentration was ten times that inside the bale. With this finding, it was concluded that the major source of contamination occurs after the cotton leaves the bale press at the gin and before the bale reaches the mill opening room; that is during transportation. It was further found that cotton bales shipped by rail and truck were heavily contaminated on the exterior surface. Inspection by railroad box cars and trucks revealed further in many cases the presence of tar substances on the floor and on the walls of these conveyances.

The following sources of tar in cotton have been suggested: Cotton fields bordering on freshly tarred roads (thrown by truck or car wheels.); tar treated picker sacks; tar dropped from air plane wheels while dusting cotton; wagon wheels while hauling cotton to gin; thrown by tractor wheels at gin; loading platforms at gins, warehouses, or mills; melted roofs at gins, warehouses, or mills; re-used bagging and bale ties; thrown up by truck or trailor wheels in hauling; inside of railroad cars; start switches of fluorescent lights; belt dressings, or hard greases; "resin sacks" in cotton burrs (ITT); and black honey dew (causes **similar** spots).

In a survey of South Carolina mills, the author learned that in 1955, tarred bale bands and tarred picking bags were still definite sources of tar spots. The latter cause could, for instance, be tracked back for certain cottons originating from the Arkansas region.

Structure and appearance—Tar spots may occur in raw cotton and in almost any type of cotton product. They show up particularly in bleached white cloth, and cloth dyed in light shades. Several authors have described the appearance of these tar spots. In finished cotton goods, they usually appear as small black pin head spots which are not removed during scouring, especially in the warp yarns; sometimes larger spots are found. Too little attention has been paid, however, to the spreading and diffusion effect described above.

The tar spots consist of tarry substances or asphalt, of petroleum or coal origin, soluble in petroleum solvents. Many other substances, such as oils, products of honey dew and even leaf and seed coat fragments. have been erroneously also classified under tar spots; microscopic examination clearly shows the difference.

Test—A testing method for tar spots consist of pressing a piece of filter paper soaked in a suitable solvent to the cotton bale to be investigated, so that some of the tar is taken up by solvent transfer. The transferred tar shows a halo under ultra violet light. It should be recognized that certain oils will do the same.

Prevention—A close inspection of cotton bales for contamination and removal of contaminated outside layers of the bale is common practice now in many mills.

The National Cotton Council has recently carried out an extensive investigation of the covering and packaging of cotton bales in connection with the prevention of tar spots. The American cotton bale is indeed most unsatisfactorily packed. A considerable quantity of the cotton is unprotected. Some hangs loose outside the bale so that also hazards of weather and fire are increased. Spinners have often protested against this practice, especially in view of the resulting contamination. Experiments have been carried out by industrial tapes and using all kinds of wrapping materials, such as: plastics, cardboard, polyethelene, vinyl, paper, saran screening, and especially non-woven fabrics appear of great interest because of the potential use of 120,000 to 200,000 bales of low grade, short staple, low micronaire cotton, which might be utilized for such covers. A great factor in considering a special wrapping, is the fact of moisture concentration inside the bale which may result in microbial damage.

Tar spot removal during finishing—The Institute of Textile Technology worked out special techniques for removal of tar spots. The spots can be removed during or after finishing.

A very effective solvent in spotting tar contaminated finished fabrics consists of four parts of Monopole oil, one part **isopropyl** alcohol, and ninety five tetra chloroethane; also soap immulsions in organic solvents can be used.

Removal of tar spots during finishing is possible by treatment in a pressure kier. A mixture of sulfonated oil and xylene is added to a 1% caustic charge.

Conclusion—Tar and asphalt contamination has been a problem in the cotton industry for many years and has had its periodic flare-ups. The observations made at Clemson College have shown that the effects of this type of damage are not always recognized by the mills, so that proper measures for prevention and correction cannot be made. Only a constant watchfulness and awareness can keep this evil down.

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Outstanding Textile Seniors

by
Alan Bell

Donald H. Logue is one of the many veterans enrolled in the Textile School of Clemson College. He is majoring in Textile Chemistry. Donald's home is located at Cheraw, S. C., but at present, he and his wife are living on the college campus.

Donald has already worked several years in the textile field. He was employed for five years by J. P. Stevens at Cheraw, S. C. Since living at Clemson, he has worked two summers at the Utica-Mohawk Mill near Clemson,

He has been attending Clemson with the aid of a Ciba Scholarship for the last two years, and has received high honors two semesters. Donald is now serving as President of Phi Psi, the textile honor fraternity. He is also a member of Phi Eta Sigma, the Society for the Advancement of Management and the Veterans' Club. He is serving as chairman of the AATCC.

Upon graduation, Donald would like to enter a sales career with a chemical company which is related to the textile industry.

Bobby L. Estridge is a textile manufacturing major who came to Clemson from Kershaw, S. C. A scholarship from Leroy Springs Scholarship and Loan Foundation has helped Bob to finance his eduaction.

He is a member of Phi Psi, Alpha Phi Omega, and is serving as secretary of the National Textile Manufacturing Society. Bobby has been outstanding in the ROTC program and now holds the rank of Cadet Captain. He received honors both semesters his Junior year and has maintained a high scholastic standing throughout his entire four years.

Bobby hopes to enter some phase of sales in the textile industry after graduating and has gained much experience by working 12 months for Springs Cotton Mills.

Daniel S. Bratkowsky, better known as "Dan" or "Brat", is a textile manufacturing major from Bridgeport, Connecticut.

Dan has received his experience in the textile field by working in several different mills. He worked one summer for Gerrish-Milliken Mill, Pendleton, S. C., and is now employed there part-time. Previous experience was obtained by working for Robertson and Son, Kobe, Japan.

Before enrolling at Clemson, Dan attended N. C. State where he was active in many school activities. He was a member of the Thompkins Textile Council and Secretary of N. C. State Veterans Association. After transferring to Clemson, Dan served as treasurer of the Phi Psi Fraternity and Secretary of the Society for Advancement of Management, Clemson College Chapter.

Dan plans to enter the production or research phase of the textile industry.

Industry Salute Proves Helpful

Another Salute to the Textile Industry, like the one just concluded at Efird's Department Store in Charlotte, N. C., is in the making. Belk-Simpson of Greenville, S. C., is planning a display of textile manufacturing equipment and products for March.

The Efird's display, which ran from January 6 through 18, was a decided success, according to store management. Thousands of people saw the operating equipment and the static displays. The store showed a substantial increase in business.

The textile industry went all out to make the show a success and many citizens of Charlotte have a far better understanding of the textile processes than they did before the Salute.

Halbert M. Jones, president of Waverly Mills, Laurinburg, N. C., and first vice president of the American Cotton Manufacturers Institute, had this to say about the Efirds exhibit:

"This exposition gave our industry an opportunity to put the textile processing story before the public at the point of sale and at the point of consumer interest. We realize the importance of making our industry known in all of its phases to the public if we're to win wide support.

"Naturally, we're grateful to Efird's for giving us this splendid opportunity to tell the story of textiles and congratulate their management upon a wonderful idea. And, too, the exposition gives the public an opportunity to understand the complexity of the industry and the wide variety of remarkable skill of those who work in the industry."

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Degree of Correlation Between Imperfection Counter Results and (A) Yarn Appearance Grade (B) Card Web Nep Count

by
Charles V. Wray
Associate Professor of Textiles
School of Textiles

INTRODUCTION

With the passing of time there is an ever increasing number of textile testing instruments of various sorts being placed on the market. These serve as working tools for the textile industry in its continuing effort to properly evaluate and improve the quality of raw stock, stock in process and the finished product. Some of these instruments measure properties which before went unexplored. In other cases, lengthy "hand" methods of testing a particularly property have been replaced by rapid automatic or semi-automatic operating instruments. This, obviously enough, has brought about a reduction in cost per unit tested.

One of the more recently developed testers is the electronic yarn imperfection counter. With this, one is able to determine the number of imperfections per unit length of yarn. The imperfections counted are neps, naps, motes and other common yarn imperfections.

Decision was reached that it would be helpful to know what correlation existed between the results of an imperfection counter and the yarn appearance grade of yarn samples. After this project was under way, the scope of the study was increased by also seeking the degree of correlation between neps per 100 square inches of the card web and the yarn imperfection counter results. With results from these two divisions of the project, it was hoped to be able to establish the following:

(a) The degree to which the neps, naps, motes and other common yarn imperfections affect the classifying of yarn samples into the various yarn appearance grades as developed jointly by The American Society for Testing Materials and The Agricultural Marketing Administration, United States Department of Agriculture. (1)

(b) The degree that card web neps count per 100 square inches will indicate the imperfections to be expected in the subsequent yarn.

MATERIALS AND METHODS

(A) Materials

With very few exceptions, 300 yards of yarn were run on the imperfection counter from each bobbin involved.

Yarn from the same lots as the imperfection counter runs of yarn had previously been graded by winding of yarn on black boards and comparison made with the photographic yarn standards developed by the laboratories of the U.S.D.A. Cotton Division and later adopted by the American Society for Testing Materials.

(2). The following descriptive designations will aid in evaluating the results that will follow:

Yarn Appearance (2)

Grade	Designation	Index
A	Excellent	130
B+	Very Good	120
B	Good	110
C+	Average	100
C	Fair	90
D+	Poor	80
D	Very Poor	70

The Yarn appearance index provides a means of averaging the appearance grade of two or more yarn numbers and for comparing yarn appearance values obtained in the testing of a specific sample with those of the general average of cotton. A yarn appearance index greater than 100 indicates higher than average yarn appearance, whereas, a yarn appearance index smaller than 100 indicates lower than average yarn appearance. This appearance of the yarn in many types of woven or knitted materials is a very important quality factor. (2)

Records were available of the card web nep counts that had been taken as the stock for the yarn used was passing through the carding process.

A desirable feature of any cotton is its relative freedom from neps, because they may be a source of trouble in manufacturing yarns and fabrics. The occurrence of neps in appreciable numbers detracts from the appearance of these products. This is especially true when they are to be dyed or printed because neps absorb dyes differently and appear as spots on the material. A determination of the number of neps per 100 square inches of card web provides a measure of the nep content. The determination is based on 10 specimens of card web totaling 360 square inches. (2)

The following adjective descriptions based on standard weight card sliver of 40 grains per yard and the standard carding rate for the particular cotton could serve to classify cottons from the standpoint of neppiness:

Number of Neps per 100 square inches of card web (2)	
15 and below	Low
16 to 30	Average
31 to 45	High
46 and above	Very High

(B) **Methods**

The bobbins of yarn were conditioned at least 48 hours prior to being run on the imperfection counter. This conditioning took place in a controlled testing laboratory having a standard atmosphere relative humidity of 65 per cent at 70 degrees F., with a tolerance of plus or minus 2 per cent in relatixe humidity and plus or minus 2 degrees F. in temperature. The imperfection counter was run in the laboratory under these same conditions.

The imperfection counter was allowed to warm up for at least an hour each day before any samples were run. Calibration was made rather often so that there would be no chance of error from this source.

In all tests run, the counter figure was read and recorded every 50 yards giving a total of 6 readings for the 300 yard bobbin run.

It must be added that the tester remained in calibration quite well during the running of the study.

RESULTS

(A) Imperfection Counter Results vs. Yarn Appearance Grade

The figures that follow are broken down by yarn counts with carded distinguished from combed.

In order to better present results the imperfections per 300 yards of yarn were reduced to imperfections per 50 yards of yarn by dividing the 300 yard figure by 6. The imperfection count per 50 yards of yarn is used in the remainder of this report except where stated otherwise.

Figure #1 shows the imperfections per 50 yards of 22's carded yarn plotted against the yarn appearance grade. The median value at each of the appearance grades was calculated and they are shown connected. The same holds true for the arithmetic mean values. The line of least squares was calculated by using the two normal equations:

$$\text{(I)}\quad \Sigma Y = Na + b\Sigma X$$

$$\text{(II)}\quad \Sigma XY = a\Sigma X + b\Sigma X^2 \qquad (3)$$

Also shown on figure 1 is the value for r, the coefficient of correlation, between the imperfection counter results and the yarn appearance grade of the bobbins of 22's carded yarn. This coefficient of correlation was determined with the formula:

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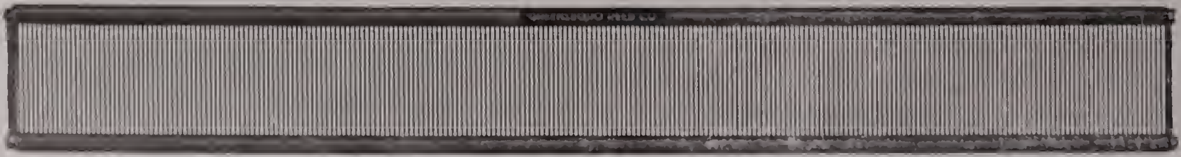

GREENSBORO LOOM REED CO., INC.

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2 [N\Sigma Y^2 - (\Sigma Y)^2]}} \qquad (3)$$

Table I shows the actual figures of results of the 22's carded yarn imperfections vs. yarn appearance grade.

Table I

(See Figure 1 also)
22's Carded
Imperfections Per 50 Yards Yarn vs. Yarn Appearance Grade

Yarn Appearance		Imperfections Per 50 Yards Yarn				
		Range		Arithmetic		
Grade	Index	Highest	Lowest	Median	Mean	Number of Bobbins Involved*
C	90	338	126	174	195	13
C+	100	266	81	154	159	65
B	110	199	78	148	139	20

*300 Yards run on Imperfection Counter from each bobbin.
Coefficient of Correlation = —.53
Line of Least Squares Data:
(1) b = 2.785 (2) a = 440.442

Table II

(See Figure 2 also)
22's Combed
Imperfections Per 50 Yards Yarn vs. Yarn Appearance Grade

Yarn Appearance		Imperfections Per 50 Yards Yarn				
		Range		Arithmetic		
Grade	Index	Highest	Lowest	Median	Mean	Number of Bobbins Involved*
C+	100	322	109	176	183	45
B	110	240	95	162.5	162	30
B+	120	147	111	142.5	137	4
A	130	69	54	62	61	10

*300 Yards run on Imperfection Counter from each bobbin.
Coefficient of Correlation = —.82
Line of Least Squares Data:
(1) b = —3.656 (2) a = 554.146

Table III

(See Figure 3 also)
50's Carded
Imperfections Per 50 Yards Yarn vs. Yarn Appearance Grade

Yarn Appearance		Imperfections Per 50 Yards Yarn				
		Range		Arithmetic		
Grade	Index	Highest	Lowest	Median	Mean	Number of Bobbins Involved*
D+	80	206	118	153	161	8
C	90	280	59	110	119	85
C+	100	177	41	93	95	105
B	110	97	46	71	70	15

*300 Yards run on Imperfection Counter from each bobbin.
Coefficient of Correlation = —.67
Line of Least Squares Data:
(1) b = —2.700 (2) a = 370.79

Table IV

(See Figure 4 also)
50's Combed
Imperfections Per 50 Yards Yarn vs. Yarn Appearance Grade

Yarn Appearance		Imperfections Per 50 Yards Yarn				
		Range		Arithmetic		
Grade	Index	Highest	Lowest	Median	Mean	Number of Bobbins Involved*
C+	100	140	50	98	98	30
B	110	101	26	73.5	72	24
B+	120	63	19	50	41	9
A	130	27	17	23	23	4

*300 Yards run on Imperfection Counter from each bobbin.
Coefficient of Correlation = —.90
Line of Least Squares Lata:
(1) b = —2.635 (2) a = 361.728

In this table will be found the highest imperfections per 50 yards for any one bobbin and the lowest imperfections per 50 yards at each yarn appearance involved. Also is shown the actual median value and the actual arithmetic mean for each grade. Given, too, is the number of bobbins that were run of each shown grade. In addition, the "b" value is given to indicate the steepness or slope of the line of least squares whereas, the shown value of "a" is the value of Y when X is zero (3). The coefficient of correlation is also stated.

Figure 2 shows the plotting of Imperfection Counter results vs. Yarn Appearance Grade for 22's Combed Yarn and was prepared in the same manner as outlined above for the figure for 22's carded.

Table II shows the actual result figures for Imperfection Counter results vs. Yarn Appearance Grade for the 22's Combed bobbins and was calculated and prepared in the same manner as the table for 22's carded previously explained.

Attention is called to Figure 3 and to table III which give results of 50's carded. Also Figure 4 and table IV which contain the 50's combed yarn results. These cover imperfections per 50 yards vs. yarn appearance grade and they too were prepared in accordance with methods as outlined for 22's carded yarn.

(B) Neps Per 100 Square Inches of Card Web vs. Imperfection Counter Results

Figure 5 shows the neps per 100 square inches of the card web plotted against the imperfections per 50 yards of 22's carded yarn bobbins. The arithmetic means at the multiples of 5 neps in the card web points are connected. In this instance, the multiple of 5 figure was used as the mid point value of a cell and all card web nep counts falling within a cell were considered as having the value of the mid-point. In calculating the line of least squares, the mid-point value technique was also applied. Figure 5 also shows

Table V

(See Figure 5)
22's Carded
Neps Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn

Neps Per 100 Square Inches Carb Web	Imperfections Per 50 Yards of Yarn			
	Range of Cell			
	Highest	Lowest	Arithmetic Mean	Number of Bobbins Involved**
10*	202	78	140	4
15	177	90	136	28
20	240	107	159	30
25	338	78	158	15
30	283	145	187	10
35	211	184	195	3
40	226	111	165	10

*Mid-Point Value of Cell
**300 Yards Run on Imperfection Counter from Each Bobbin
Coefficient of Correlation = +.47
Line of Least Squares Data:
(1) b = 1.613 (2) a = 120.328

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the coefficient of correlation, r, existing between the neps per 100 square inches of card web and the imperfections per 50 yards of yarn. Method of finding coefficient of correlation has been explained elsewhere in this report.

Table VI

(See Figure 6)
22's Combed
Neps Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn

	Imperfections Per 50 Yards of Yarn			
	Range of Cell			
Neps Per 100 Square Inches Carb Web	Highest	Lowest	Arithmetic Mean	Number of Bobbins Involved**
10*	248	116	155	5
15	239	109	169	19
20	240	95	160	25
25	352	109	177	13
30	311	162	192	13
35	229	184	206	2
40	277	158	193	5

*Mid-Point Value of Cell
**300 Yards Run on Imperfection Counter from Each Bobbin
Coefficient of Correlation = +.45
Line of Least Squares Data:
(1) b = 1.644 (2) a = 138.664

Table VII

(See Figure 7)
50's Carded
Neps Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn

	Imperfections Per 50 Yards of Yarn			
	Range of Cell			
Neps Per 100 Square Inches Carb Web	Highest	Lowest	Arithmetic Mean	Number of Bobbins Involved**
5*	146	46	78	10
10	160	41	87	45
15	194	59	100	69
20	239	63	110	44
25	280	76	113	25
30	184	65	115	15
35	141	82	111	5
40	177	74	119	10
45	210	149	179	4

*Mid-Point Value of Cell
**300 Yards Run on Imperfection Counter from Each Bobbin
Coefficient of Correlation = +.60
Line of Least Squares Data:
(1) b = 1.538 (2) a = 74.927

Table VIII

(See Figure 8)
50's Combed
Neps Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn

	Imperfections Per 50 Yards of Yarn			
	Range of Cell			
Neps Per 100 Square Inches Carb Web	Highest	Lowest	Arithmetic Mean	Number of Bobbins Involved**
5*	76	17	35	14
10	86	50	65	10
15	111	67	87	9
20	128	67	81	12
25	137	68	98	10
30	99	50	74	5
35	113	100	106	2
40	140	84	112	5
45	97	89	93	2

*Mid-Point Value of Cell
**300 Yards Run on Imperfection Counter from Each Bobbin
Coefficient of Correlation = +.77
Line of Least Squares Data:
(1) b = 1.594 (2) a = 46.934

Table V shows the actual values of the 22's carded results for card web neps vs. imperfection counter results. The mid-point cell values, highest and lowest imperfection count at each value, arithmetic mean of imperfections and bobbins involved at each value are shown. Also given is the coefficient of correlation as well as the "a" and "b" values found in the calculations for the line of least squares.

Figure 6 and Table VI show the results for 22's combed yarn card web nep count vs. imperfection counter results.

Figure 7 and Table VII show results for 50's carded.

Figure 8 and Table VIII show results for 50's combed. The explanation given above for the figure and table for 22's carded also applies to the tables and figures for 22's combed, 50's carded and 50's combed.

DISCUSSION OF RESULTS

22's carded, 22's combed, 50's carded and 50's combed were handled individually for two reasons. First, each of the 4 requires a different sensitivity setting on the imperfection counter. Secondly, 22's and 50's are compared against a different set of standards for yarn appearance grading. 22's fall into the 16.5's to 32.0's group while 50's fall into the 32.0's to 65.0's group (1).

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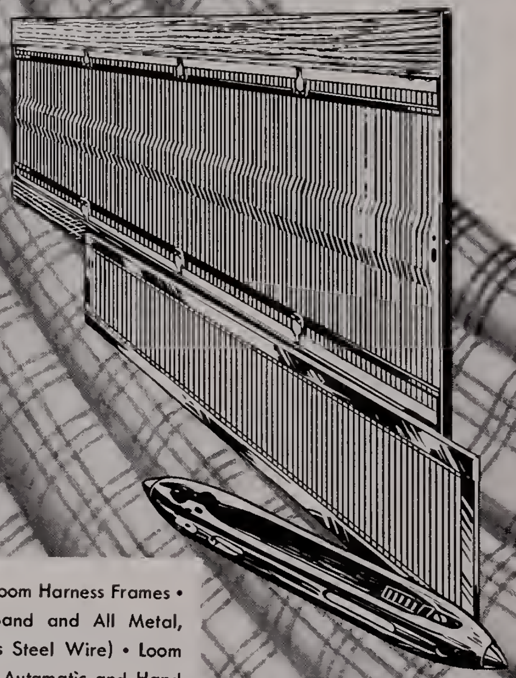

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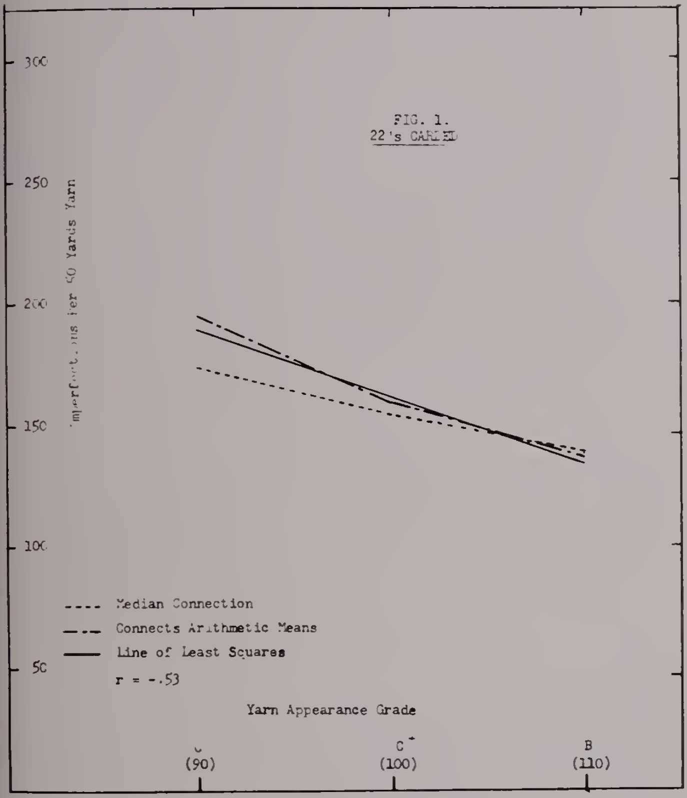
FIG. 1.
22's CARDED

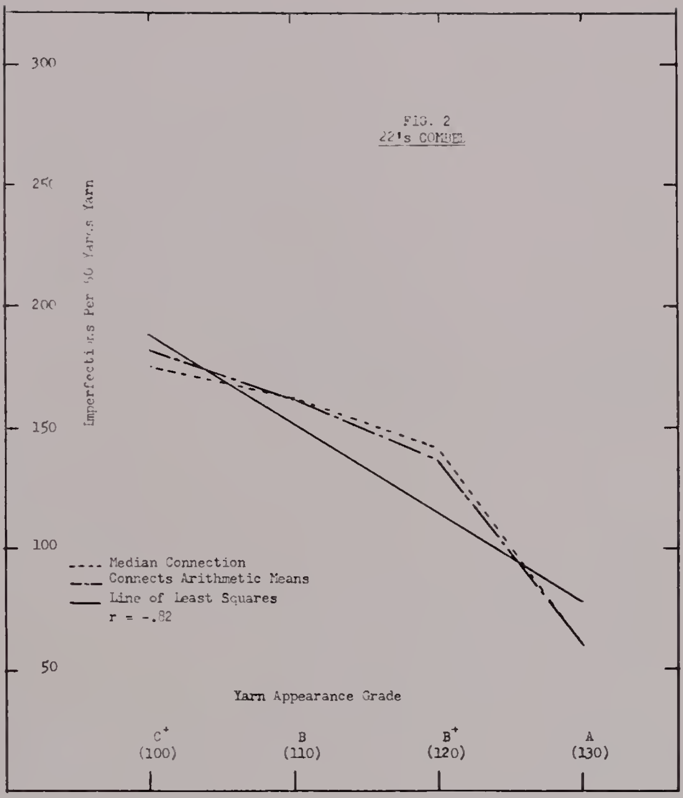
FIG. 2
22's COMBED

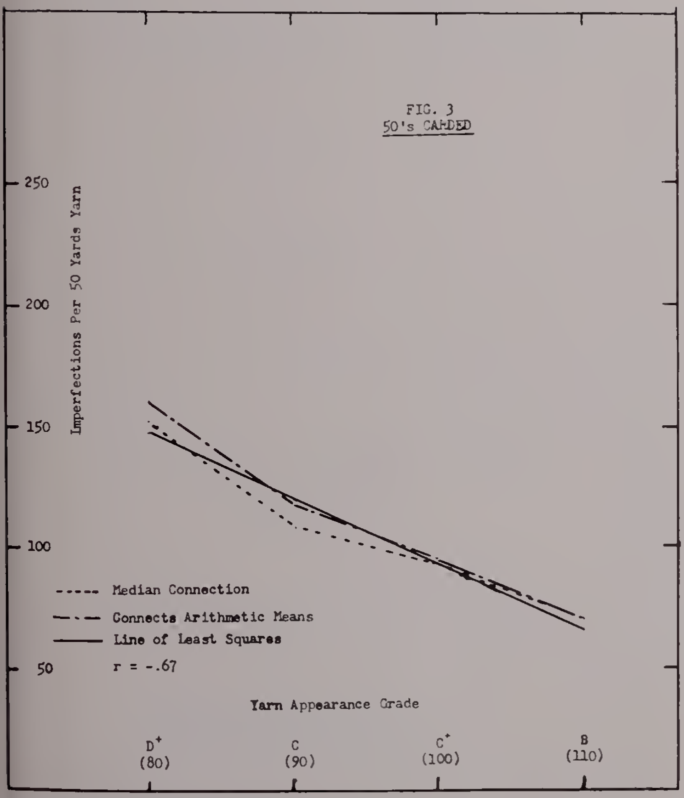
FIG. 3
50's CARDED

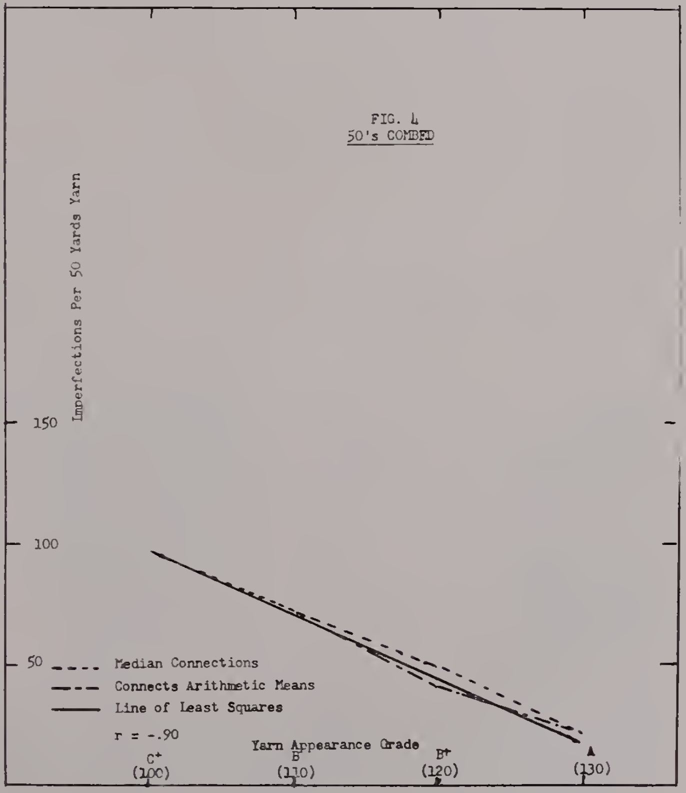
FIG. 4
50's COMBED

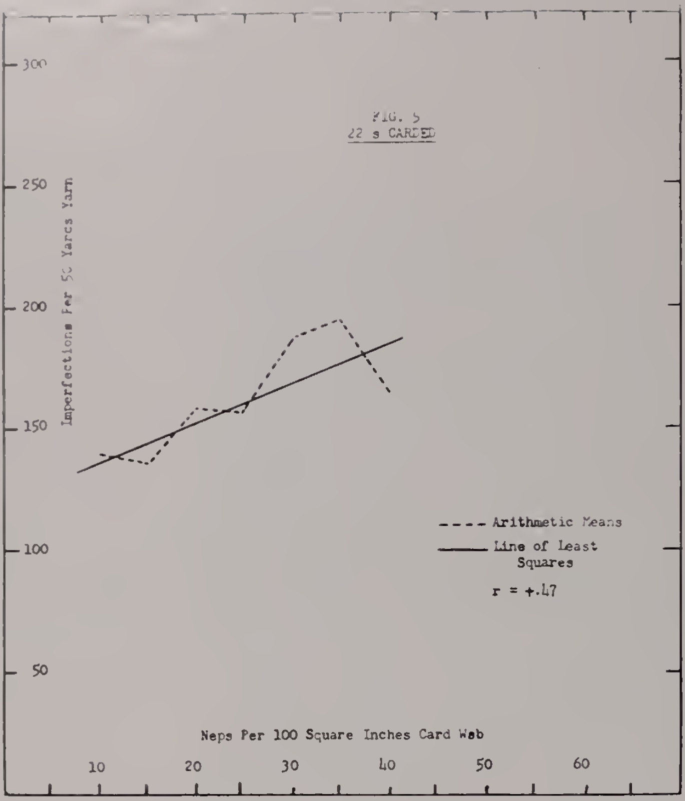

FIG. 5
22's CARDED

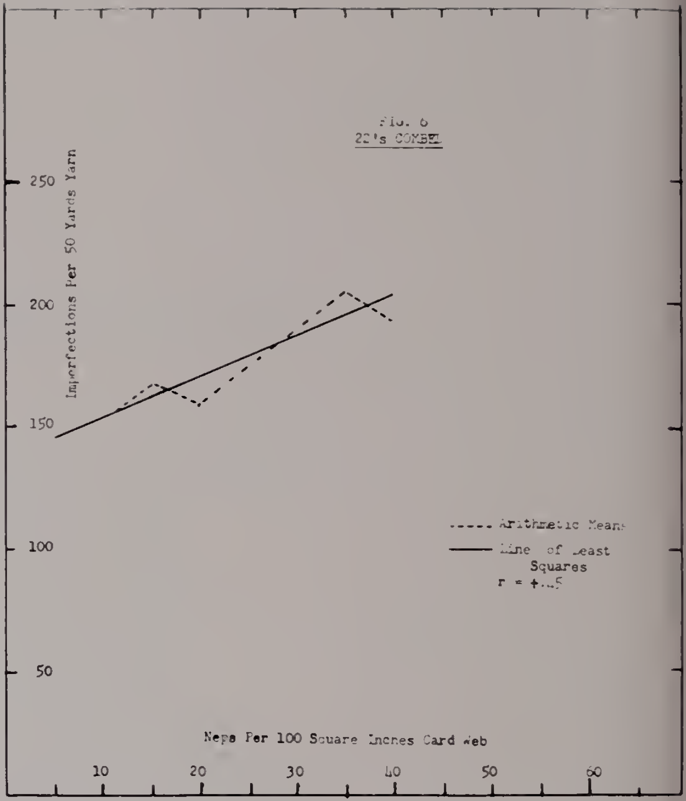

FIG. 6
22's COMBED

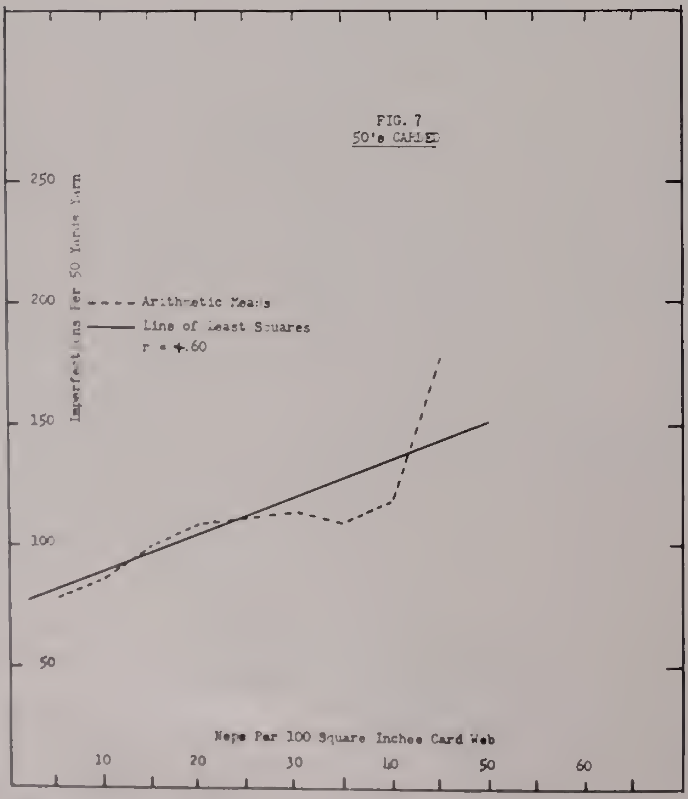

FIG. 7
50's CARDED

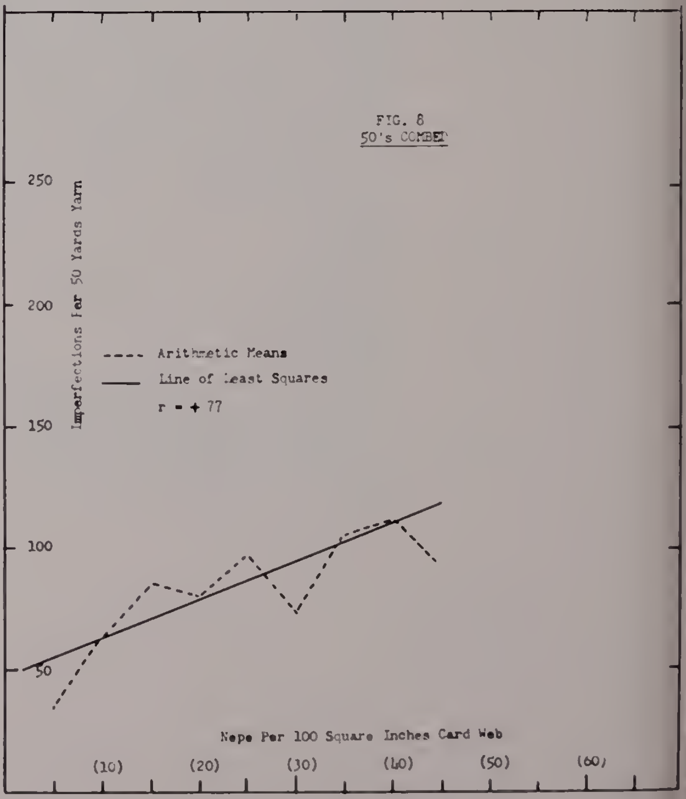

FIG. 8
50's COMBED

In Figures 1 through 4 the line of least squares has a descending slope, whereas in Figures 5 through 8 this line has an ascending slope. The directions of slope are as were expected. In the case of Figures 1 through 4, the horizontal scale, Yarn Appearance Grade, improves in grade from left to right. Therefore, these figures 1 through 4 show the decrease in the number of yarn imperfections as the yarn appearance grade improved. In figures 5 through 8 can be seen, by the line of least squares, the rate the imperfections counted in the yarn increased as the neps in the card web increased.

As can be seen in Figure 2, the line of least squares at B+ yarn appearance grade is somewhat lower than the median or arithimetic mean values. This is caused by the small number of bobbins run of this grade having little effect on the line of least squares. Another reason is the lowness of imperfection values of the bobbins in grade A.

In Figures 1 through 4 the coefficient of correlation is negative. This is because in straight-line relations if the line has a negative slope then the correlation is said to be negative and actually works out as a negative figure. In Figures 5 through 8 the coefficient of correlation is positive because the line has a positive slope and the correlation actually works out as a positive figure (4).

At least 300 yards samples should be run on the imperfection counter and better still 500 yards. This is because quite a variation in imperfections was found from one 50-yard length to the next, so short length runs would not give representative results. A coefficient of variation ran as high as 18.31% on one bobbin from which twelve 300 yard runs were made on the imperfection counter.

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A summary of the coefficients of correlation follows:

Coefficient of Correlation

Yarn	Yarn Appearance Grade vs. Imperfection Counter Results	Card Web Neps vs. Imperfection Counter Results
22's carded	— .53	+ .47
22's combed	— .82	+ .45
50's carded	— .67	+ .60
50's combed	— .90	+ .77

The coefficient of correlation is a number varying from +1, through zero, to —1. The sign indicates whether the slope is positive or negative, while the magnitude of the coefficient indicates the degree of association. Most authorities agree that a correlation coefficient of .9 or higher indicates close association between the two variables (3). When the coefficient of correlation is +1 or —1 then there is perfect correlation. When it is zero there is complete absence of correlation (4).

With the coefficient of correlation, the coefficient of determination may be found by squaring the coefficient of correlation:

$$d = r^2 \qquad (4)$$

Therefore, the coefficients of determination for the above summary of coefficient of correlation would be:

Coefficient of Determination

Yarn	Yarn Appearance Grade vs. Imperfection Counter Results	Card Web Neps vs. Imperfection Counter Results
22's carded	.28	.22
22's combed	.67	.20
50's carded	.45	.36
50's combed	.81	.59

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To explain the results just above:

We find from the table that the coefficient of determination for 50's combed yarn appearance grade vs. imperfection counter results is .81. This shows that about 81% of the variance in the selection of the yarn grade for these samples could be accounted for by the differences in the imperfections in the yarn. In like manner, the coefficient of determination for 50's combed yarn card web neps vs. imperfections counted in yarn is .59. This shows that about 59% of the variance in the imperfections counted in this yarn could be accounted for by the difference in the neps in the card web per 100 square inches (4). Since this leaves 41% of the variance to be accounted for by other factors, it would appear that the card web neps, for the stock of this yarn, was the most important factor which was associated with the imperfections found in the yarn (4).

Covering the yarns of the study:

Yarn	Per Cent Qarn Grade*	Per Cent Card Web Neps**
22's carded	28%	28%
22's combed	67%	20%
50's carded	45%	36%
50 s combed	81%	59%

*About the percent the variance in the selection of the yarn grade for the samples could be accounted for by the difference in the imperfections in the yarn.

**About the per cent the variance in the imperfections counted in this yarn could be accounted for by the differences in the neps in the card web per 100 square inches.

From the above table it can be seen that with 22's combed and 50's combed the imperfections in the yarn was more important than all other factors in the selection of yarn appearance grade. With 22's carded and 50's carded this is not true.

Also, the number of card web neps per 100 squares inches was not more important than all other associated with the imperfections found in 22's carded, 22's combed and 50's carded.

The imperfection counter method used doesn't pick up uniformity or non-uniformity of long duration, fuzziness, general surface sheen, slubs or color. These would no doubt be some of the other factors in selection of the appearance grade of yarn samples.

L. C. MARTIN
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The tension device both on the imperfection counter and the observation board winder knock from the yarn some trash, neps, etc. This could be at least a small factor in preventing close correlation between card web neps and yarn imperfections counted.

It is felt that a greater degree of correlation would have resulted had the raw stock for all the yarns been the same. As it was, different bobbins of the same count carded, or same count combed, were made up of cottons of various varieties, grown at various localities, had different staple lengths, were of various cotton grades, of various crop years and in some instances were run at different pounds per hour production on the card. With all these variables, the magnitude of correlation was more than might be anticipated under conditions such as these.

SUMMARY

(1). The approximate per cent the variance in the selection of the yarn grade for the samples could be accounted for by the differences in the imperfections in the yarn:

Yarn	Per Cent
22's carded	28%
22's combed	67%
50's carded	45%
50's combed	81%

(2) The approximate percent the variance in the imperfections, counted in this yarn, could be accounted for by the difference in the neps in the card web per 100 square inches:

Yarn	Per Cent
22's carded	22%
22's combed	20%
50 s carded	36%
50's combed	59%

(3). The degree of correlation was greater than was expected with raw stock and card production rate variables being what they were.

(4). A similar study made with raw stock and card production rate variables eliminated should show a much higher correlation.

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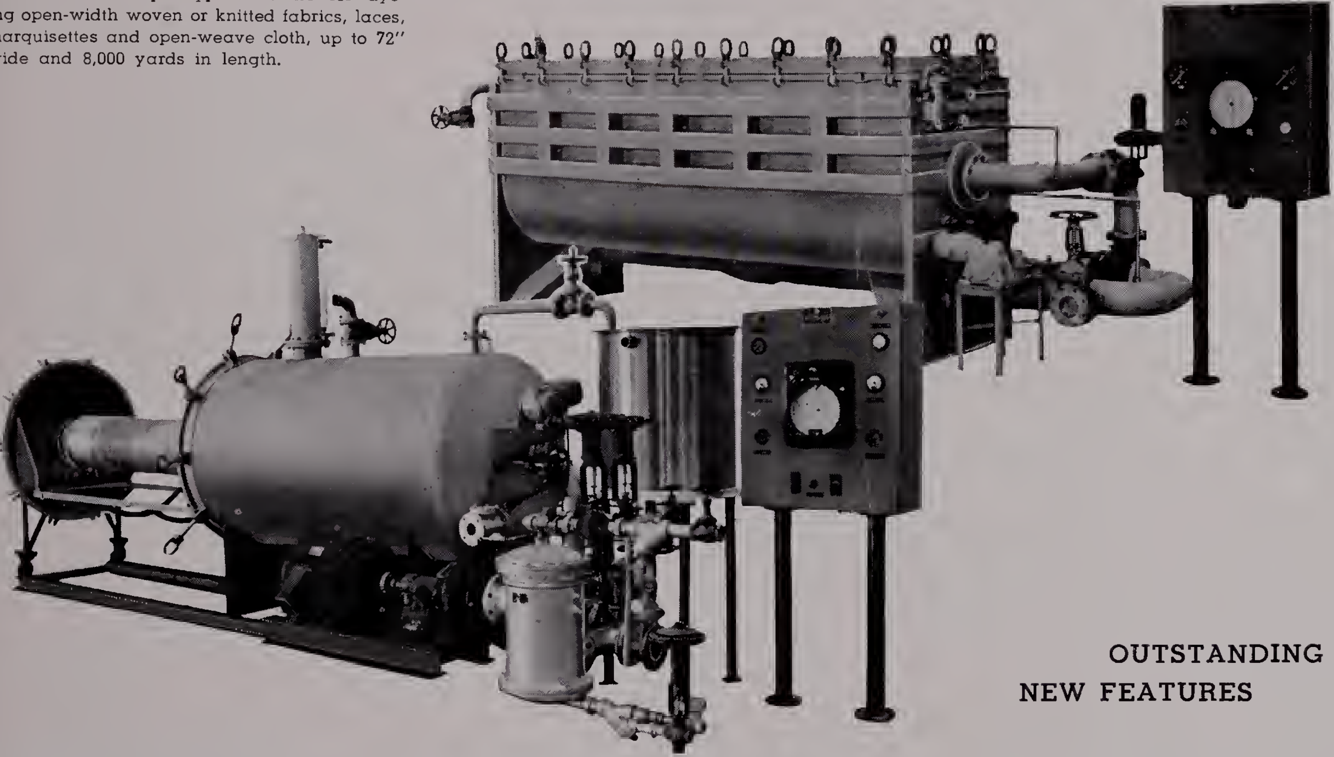

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AUTOMATIC BEAM REVOLVING DEVICE

The dye beam is revolved by a constant speed driving mechanism and this assures even penetration during the scouring and dyeing cycles. This feature minimizes shading and produces level dyeing from end to end of the dye beam.

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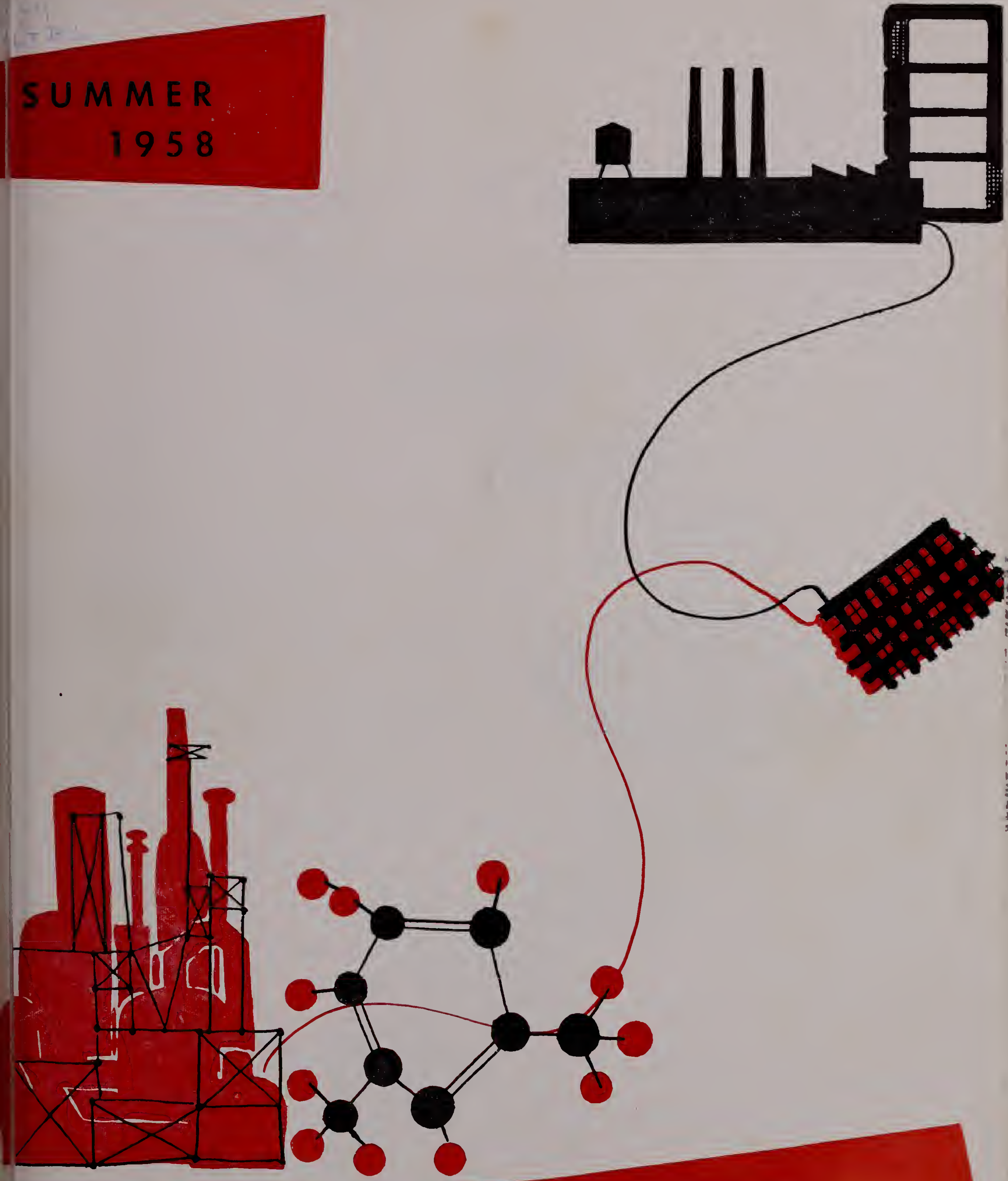

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VOL. 16 **SUMMER ISSUE** **NO. 4**

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Cover Explanation: The cover is in keeping with the general theme of the summer issue—man-made and cotton fabrics and blends of these fibers. The product of the synthetic plant in the lower corner is joined to the product of the cotton mill in the upper corner in forming a blend fabric in the center, and this depicting theme of this issue. —Cover Design by Russ Campbell

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From the Editor . . .

It seems to be the custom of incoming staffs to address the readers and let them know what is in store for them in the coming year. Rather than deviating from this practice, the 1958-1959 staff of THE BOBBIN & BEAKER looks forward to letting the readers of our publication know what to expect in our publication.

This year, for perhaps the first time, the staff will attempt to present to you an entire issue based on a central theme. This seems to be a rather large undertaking for a student group, but with the help of men prominent in the textile industry and textile education, we have undertaken this plan with the hope that our readers will find our publication as interesting and informative as in the past.

This present issue, for instance, has for its central theme, cotton, wool, and man-made fibers and blends of these fibers. Included in our articles is one on synthetics in the carpet and rug industry, and one on man-made fibers and blends in novelty fabrics. We also have articles on blending for better textiles with a follow-up article on improved blend fabrics. The cotton and wool industry are by no means left out, as will be seen when you read our guest articles on the future of these two fibers.

This issue has been long in the planning and we hope you share our enthusiasm when you read our wide variety of interesting, informative guest articles.

—Wayne Freed, Editor

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Synthetics in the Carpet and Rug Industry

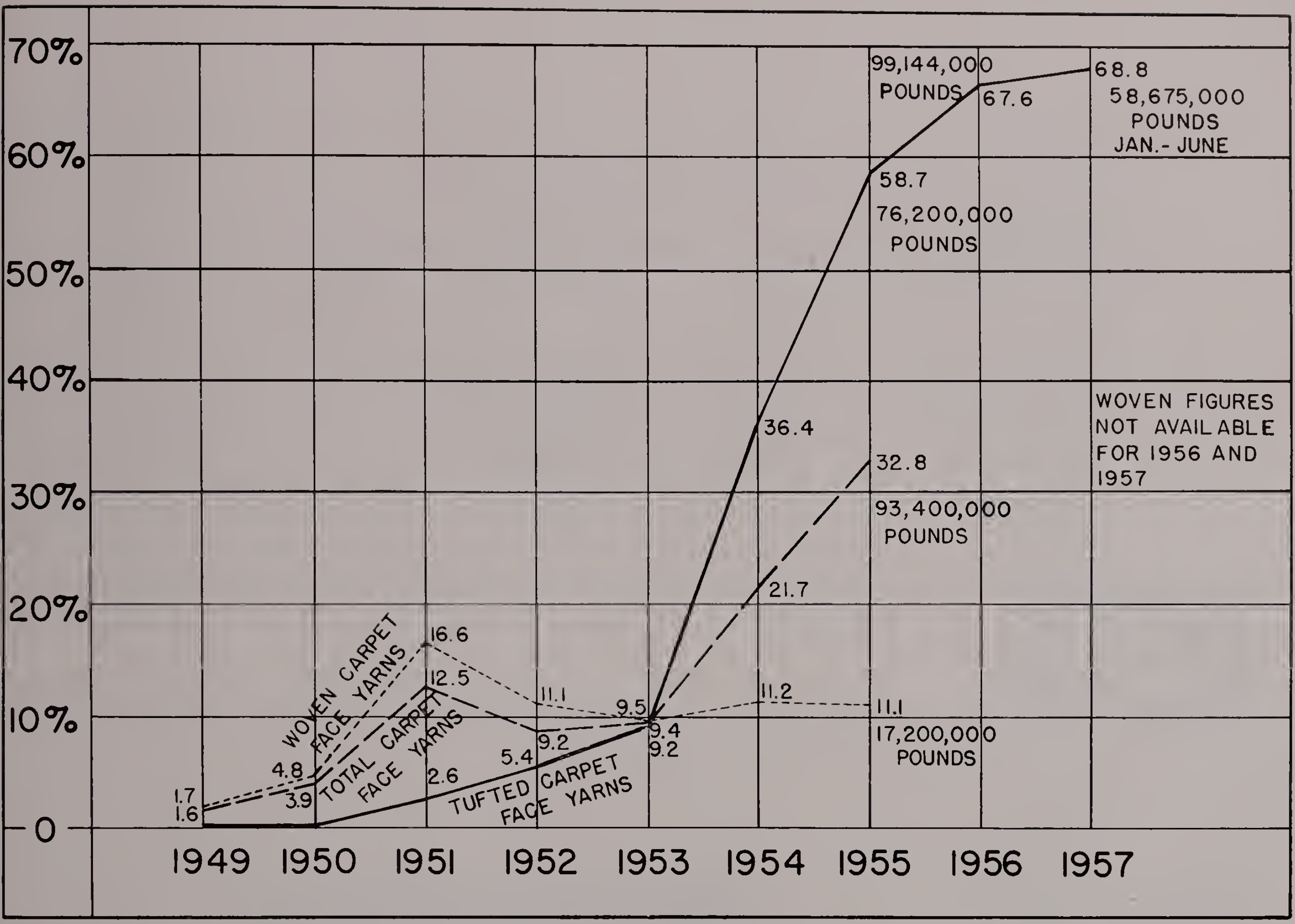
A. U. Priester, Jr.
Vice President and General Manager
Hillcrest Division, Callaway Mills Company
LaGrange, Georgia

The development and use of man-made fibers in rugs and carpeting has been one of the most interesting chapters in the history of the floor covering industry. Side by side with this trend and interwoven with it has been the spectacular growth of tufted rugs and carpeting. Together these developments have created a revolution in the industry. Most amazing is the fact that this has occurred largely since World War II.

The meteoric nature of these changes is graphically emphasized by the statistics available. Synthetic fibers, which represented less than 2% of the total fibers used in rug and carpet face yarns in 1949, claimed 33% in 1955, including 11% of the woven face yarns and over 58% of the tufted face yarns. In 1956 synthetics claimed over 67% of the tufted carpet poundage and in the first half of 1957 close to 69%. Tufted carpeting, which represented only 9% of the total square yards of rugs and carpeting in 1951, claimed 46% in 1956 and in the first half of 1957 reached 51%.

Let us look at the background that made these changes possible. For hundreds of years the traditional woven wool rug had gone unchallenged. Wool was carpet king and everyone accepted that fact. Of course, there were a few cotton bathmats and scatter rugs and a few fiber rugs for porch or sun parlor, but these did not seriously offer even a slight threat to the market for wool rugs. However, when the price of wool skyrocketed during World War II, experimenters began to look around for a substitute for wool. This was essential, for with the outbreak of the Korean war the price of carpet wool, all of which is imported, climbed from 70 cents a pound in November 1949 to something like $2.40 in the spring of 1951 and consumers were showing a sturdy resistance to corresponding prices of the finished produce. Therefore, carpet manufacturers felt compelled to turn to cotton and synthetic fibers to supply the consumer demand for inexpensive or moderately priced rugs.

In addition to questioning the traditional wool, experimenters became bolder and began to question whether rugs had to be woven. For some time bedspreads and small scatter rugs had been machine-made by a tufting process, and farsighted textile men began to consider the possibility of producing large rugs by this same method. Briefly, in this less expensive process, carpeting is made by punching yarns in tufts into jute or duck or canvas fabrics, the loops being either cut or left uncut. A rubber-like coating is placed on the back in order to add body, to lock the loops tightly, and to provide skid resistance. Experimentation showed that large carpets could be made by tufting, and a rapid change from 12-needle machines to those of over 1600 needles followed, the first broadloom tufted carpeting having been made late in 1950. One big tufting machine, it has been reported, can produce as much corpet as ten to fifteen regular carpet looms. Development after development in rapid succession made possible such improvements as better styling, yarns specifically engineered for tufted carpets, pattern mechanisms to control the height of individual tufting yarns, the reinforcing of carpet backing with scrim or other material to obtain dimensional stability, improved dyeing procedures, and techniques for printing tufted carpets.



Man-made Fibers in Carpet Face Yarns. This shows the percentage by years of the total face or pile yarns that were made of synthetic or man-made fibers. Note that 67.6% of all carpet face yarns used in 1956 were synthetic, compared with about 9% in 1953. (This chart is based on figures in "Textile Organon" Supplement, October 1957, except 1956 and 1957 tufted figures from U. S. Bureau of Census "Facts for Industry."

Wool prices and the development of tufted carpeting have both influenced the distribution of fiber consumption. In 1937, 80% of the rugs and carpets were wool. This percentage remained about the same through 1949. In 1950, due to the high cost of wool, the percentage dropped to 62% and in 1951 to a low point of 35%. In 1952 the trend reversed and by 1955 the figure for blended wool and man-made fibers in woven carpet output had dropped to 20% and in 1956 to 17%. This means that wool has tended to regain its position in woven carpets and it is in tufted that man-made fibers have made their greatest advances.

Almost all the first tufted carpeting was cotton, but the trend to rayon and acetate was soon apparent. The use of rayon and acetate in the tufted textile industry grew from 1,011,000 pounds, or less than 2% of the total, in 1951 to 88,332,000 pounds in 1956, representing 51% of the total fibers used and thus displacing cotton as the major fiber in tufting. These figures cover the entire tufted field, including not only rugs and carpeting, but also robes, bedspreads, etc. A breakdown was not made in these statistics until 1956, when rayon and/or acetate in tufted rugs and carpeting represented 87,113,000 pounds or 59.4%; cotton, 40,599,000 pounds or 27.7%; wool (for all tufted products, but non-carpet uses probably negligible), 6,817,000 pounds or 4.6%; and other fibers (primarily nylon and nylon-rayon mixture yarns), 12,031,000 or 8.2%. The first six months of 1957 showed the following distribution: cotton, 19,738,000 pounds or 23.1%; rayon and/or acetate, 51,818,000 pounds or 60.7%; wool, 6,971,000 pounds or 8.1%; and other fibers, 6,857,000 pounds or 8.0%. This means that synthetics claimed 99,144,000 pounds or 67.6% of the poundage in tufted carpeting in 1956 and 58,675,000 pounds or 68.8% in the first half of 1957.

Tufted floor covering has changed carpet production into a fast moving, dynamic industry. The period since 1948 has been a tumultuous one. It has been said that this period has probably seen more changes in products alone, to say nothing of technical developments, distribution and merchandising techniques, than the previous hundred years. Top designers have been engaged to supply stimulating vitality, and new patterns and weaves have been introduced. Fibers that initially were used as industry's answer to a dwindling wool supply and an unstable wool market are not substitutes but a permanent addition to the

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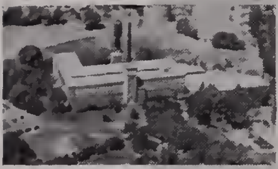
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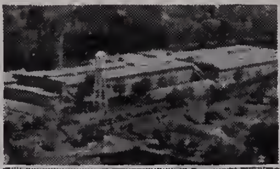
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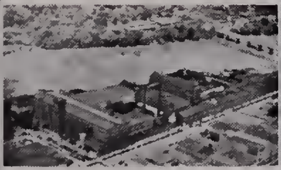
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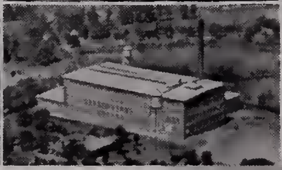
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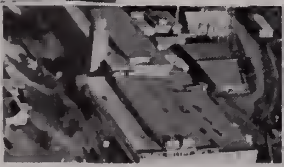
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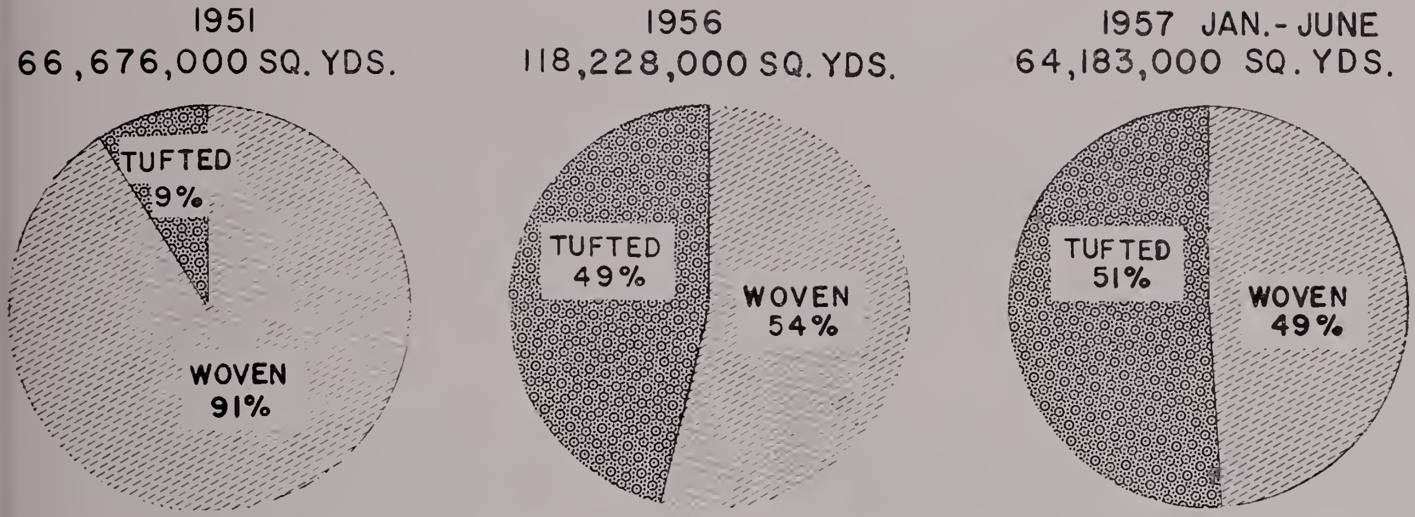

Production of carpeting and rugs (larger than 4′ x 6′). This shows that the production of carpets and rugs virtually doubled between 1951 and 1957, and that the tufted types represented 9% of the 1951 production and over half of the January-June 1957 carpet.

raw material picture. And new fibers and blends are constantly being added.

Rayon, of course, has supplied the bulk of the synthetics used in carpets and rugs, over a million pounds having been used annually in 1955 and 1956. According to estimates, rayon consumption in 1957 reached a record 115 million pounds. It was natural that manufacturers turned to rayon, for it made possible luxurious, colorful, textureful, low-priced carpeting. Constant concerted research, with fiber and yarn producers working closely with carpet and rug manufacturers, has produced improved rayon carpet yarns. Smooth surface carpet staple was designed to give loop pile carpets greater soil resistance and ease of cleaning. Harsher crimped staple increased resiliency and wearability. Solution-dyed and vat-dyed yarns guarantee colorfastness. Bulked or lofted filament yarns provide greater covering power, elasticity, a wider variety of textures, and clearer color and pattern definition because of freedom from pilling and fiber migration. These yarns are especially well adapted to the currently popular tweeds and moresques. A major impetus to large scale development of bulked filament in carpets has come from the success of bulked solution-dyed acetate filament since it was introduced the latter part of 1956. The man-made fiber figures undoubtedly incorporate a growing proportion of synthetics other than rayon, notably nylon and in the last year or so, several acrylic fibers.

The current trend to tufted carpeting has been due only in part to the wool situation, for it also fits into a larger changing economic pattern. The most significant recent change is the rise of a great new moneyed middle class, continuing to grow larger and wealthier—the result of the nation's increasing productivity. The United States is fast becoming a one-class market of prosperous middle-income people. This means that millions of Americans are reaching the point of having more than the absolute necessities, and it would seem to indicate the tremendous need for moderately priced carpeting and rugs. Furthermore, not only is the middle-income class growing but the population as a whole, despite a virtual cessation of immigration, is increasing faster than it has in forty years. American women are once again raising large families and the birth rate is soaring. All this means more houses and consequently more potential customers for carpets. And these customers are likely to live in the suburbs where the dominant way of life is simple and informal. More Americans are staying at home and taking pride and interest in making their surrounding more attractive. The soft floor covering market is an unsaturated one. In 1945 only 9% of American floors had any rugs or carpets on them. Even in the best year since then, the industry has sold only 2.3 square yards per family. This leaves most of the 91% of American floors still bare.

Tufted carpeting, moderately priced and with its variety of warm colors, fits into this picture perfectly. As it has been continually upgraded, it now competes not only in price, but also in style and quality. Accordingly, more people can afford more corpeting and can select from a much wider range of colors and patterns than ever before. Decorators love the array of color possibilities, and more women are learning to do their own decorating tastefully. Tufted carpeting and man-made fibers have already demonstrated that they are what America wants, for they are rich with the beauty of the rainbow and as modern as the dreams of tomorrow's homeowners!

The Place of Man-Made Fibers and Man-Made Fiber Blends in Novelty Fabrics

By Jackson Weldon
Plant Manager, Seminole Mills
Clearwater, South Carolina

Not too many years ago the term "Novelty", as applied to woven fabrics usually indicated that the cloth was either made from fancy twisted yarns or was woven in a very intricate weave pattern. In most instances the novelty weave pattern prevailed, regardless of the character of yarn. In fewer instances novelties were produced in yarn combinations of silk and wool, worsteds, etc., also usually with the novelty weave. In those days, say, the 1920's, and prior to that time, the manufacturer of novelty fabrics depended largely on an intricate, expensive weave pattern. Novelty yarns were largely limited to, in order of importance, fancy twisting, blending of raw stock dyed flakes or nubs and inter-blending of two or more of the natural fibers together. The four principal fibers of importance in novelty goods were cotton, wool, silk and flax, all natural fibers. Very great ingenuity and imagination had been exercised by the textile industry and imagination had been exercised by the textile industry in developing fabrics from those fibers to, as nearly as possible, meet the greatest needs of man.

Progress and development of the chemical industry created the commercial introduction of many man-made fibers to textiles during the past 30-35 years. The very first of these fibers, rayon, promptly put down its roots in the industry, doubtlessly coming as a surprise to many who might have considered the textile fiber potential as being forever complete. Once the fiber barrier was broken man began to introduce numerous other new fibers, such as, to name a few, acetate, nylon, dacron, acrilan, dynel, glass, metallic yarns. Others, too numerous to mention, are in small production or the experimental stage.

To measure the success of the man-made fibers to date one needs only to consult the records and note that between 1937 and 1955 the consumption of man-made fibers has risen from 7%, of all fibers, to 26%. This remarkable success is attributable only to the great number of assets and advantages brought to novelty fabrics, as well as others, by the man-made fibers. Chemists are able to compose into them specific desirable properties and potentials, many of which are unprovided for by nature in the natural fibers.

Blends of man-made fibers and blends of man-made fibers with natural fibers provide almost unlimited color possibilities in the finished fabrics. The two very earliest of the man-made fibers, viscose and acetate, greatly expanded the field of cross dyeing, making it possible for the stylist to provide combinations of colors, in the same fabric, ranging from light to sharp contrasts. While the viscose and acetate fibers are the most widely used combination for cross dyeing, similar effects can be obtained by the use of combinations of many of the other fibers. For cross dyeing purposes the greige fabric is usually woven either with heather blended yarns, or with two or more yarns, each composed totally of different fibers. Other types of yarns often produced for cross dyeing are plied yarns, each ply member containing contrasting fibers, and certain types of fancy yarns containing contrasting fibers, and certain types of fancy yarns containing nubs, flakes, splashes, etc., with these additives being composed of contrasting fibers. After weaving any one fabric with any of the above combinations it is then possible to choose from a number of color combinations for the dyeing. Raw stock dyed fabrics, in addition to being very expensive do not have this versatility of color selection after weaving.

Man-made fibers also offer the option of selecting the "hand" of any fabric to be produced. If crispness is desired the fiber deniers can be coarsened. If a soft feel is desirable the finer deniers can be chosen. To produce a wooly effect a small percentage of extremely coarse deniers can be included in the blend. Proper selection of deniers and staple lengths, coupled with proper mechanical preparation of yarn, produces a superior linen fabric. If great strength and wear resistance are desirable man-made fibers can be selected to provide these characteristics to a degree not possible in natural fibers. Some of these fibers have also brought to the consumer added values in wrinkle recovery and ease of care.

The fabrics discussed above acquire the description, "fancy", or, "novelty", as the case might be, from the blends, yarn structure and end results of finishing. Certainly, fancy weaving and raw stock dyeing are unrequired to place them in the novelty or fancy category. The result is a lower weaving cost. The raw material cost, per pound of woven goods, is also usually lower in novelty fabrics made of man-made fibers than in those made of natural fibers. This is of tremendous economic importance since it provides beautiful fabrics to the consumer at moderate prices.

The existing man-made fibers have many undeveloped possibilities. Many are only a few years old and the mills have not had enough experience with them to overcome all the spinning and weaving problems. Similarly certain problems in dyeing have not been completely solved. Meanwhile, more promising fibers are bing produced at the rate of several per year. Each is designed to improve upon the older fibers or to make something entirely new. Having accomplished so very much in so little time it is only logical to foresee a rapid growth of widely diversified novelty and other fabrics of man-made fibers. This revolutionary phase of the textile industry is now only in its infancy. The natural fibers have valuable assets that doubtlessly insure their permanent usage. The destiny of man-made fibers and fabrics lies in designing them to fill the wide gaps in usefulness and to stimulate new conceptions of beauty and appeal.

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Blending for Better Textiles

By Charles H. Rutledge
Manager, Product Information Section
Textile Fibers Department
E. I. du Pont de Nemours & Co., Inc.

Recent developments in the study of blending indicate that the key to tomorrow's better textiles lies in large measure with the scientifically engineered union of natural and man-made fibers.

All fibers have their own "personalties." They have their good points and some weak points. In blending, the trick is to produce a fabric with a maximum amount of good points. In many instances, the strong points of one fiber will balance out the weak points of another. This is the answer to the question: "Why have blends?"

Actually blending in the textile industry is not particularly new. The practice has been going on for years. Initially, the natural fibers were blended. Wools of different grades and assortments have been blended for generations to produce fabrics with appropriate texture, hand, and price for a given use.

With the advent of man-made fibers—the cellulosics—we added further versatility through blending. In recent years, the development of the chemical fibers has added new working tools, new ingredients to open even wider vistas through blending.

While the basic properties of the newer fibers made them naturals in many cases for industrial use—with sound and proper developments, of course—their use in apparel means that they must meet fastidious specifications of aesthetics, fashion, and other factors. Therefore, it is no longer sufficient to rely entirely upon experience and plain artistry in blending fibers.

Like the metallurgist and rubber chemist, we must know what we are doing. The complexity of fiber characteristics and properties requires a thorough understanding of the fibers and a sound approach in utilizing them. Sensibly handled, they provide fabrics with beauty, strength, functionality, and concepts of design that were unheard of a few years ago.

As each of the new synthetic fibers emerged from the laboratory, its strong points were recognized immediately. However, as developments progressed and we gained experience, it became apparent that the outstanding contributions of the new materials carried with them restrictions that could not be ignored.

We are all familiar with the early difficulties encountered in dyeing the new fibers. Fuzzing has been a problem, particularly with the tougher, durable fibers. We have grappled with static, which is common in greater or lesser degree to all of the chemical fibers and is no stranger to wool.

Early recognition of the contributions, as well as the limitations, of the newer fibers immediately suggested blending as a practical means of capitalizing on the outstanding positives and at the same time controlling the negatives. Blending becomes even more attractive when we recognize that the newer fibers such as nylon, "Dacron" polyester fiber, and "Orlon" acrylic fiber have outstanding properties that complement the natural and cellulosic fibers. In many cases, the converse is true, the natural and cellulosic fibers augmenting the chemical fibers where they need help. This we deem a realistic approach.

Consequently, we have devoted several years of research into blending with the following objectives in mind:

(1) To obtain a thorough understanding of the inherent characteristics of individual fibers.

(2) To explore their reactions with each other in blends.

(3) To develop the means for effective use of all available fibers—natural, cellulosic, and chemical.

The goal in all this has been to provide help to the textile industry and to promote better use of the chemical fibers for the development of fabrics that are sound from the standpoint of consumer dollar value.

One effect of this research has been to combat the "gimmick" use of these fibers. We have developed information that has been passed along to the trade that insignificant percentages of the newer fibers in a fabric contribute exactly nothing in the vast majority of cases.

For example, when you have a high percentage of rayon in a rug with a small percentage of nylon, you still, for the most part have a rayon rug. That principle holds true almost across the board, an exception being that small percentages of nylon in the reinforcing of socks will increase wear life. The same is true in the use of nylon with cotton in denims, work gloves, and the like.

For the most part, however, if you want the performance of pleat retention, crease retention, wrinkle resistance, ease of care, and other plus properties offered by the newer fibers, then there must be a sufficiently high percentage of those fibers in a fabric to provide the desired results.

Unfortunately, there have been too many cases where extreme claims have been made for insignificant percentages of nylon, "Orlon," and "Dacron." At no stage is there a miracle—even in 100 per cent constructions of the newer fibers — and certainly the miracles will not be forthcoming in low-percentage blends.

Those "gimmicks" not only result in widespread consumer dissatisfaction, but ultimately they will result in stringent labeling regulations.

It has been 19 years since the world's first commercial nylon plant went into operation. That eventful day was December 12, 1939, when men in Seaford, Delaware, kept their fingers crossed as the power was turned on in the Du Pont Company's new venture.

That first plant — which was built concurrently with a pilot plant and therefore was not scaled up from the smaller version — operated successfully, quite fortunately. That supreme effort cultimated more than a decade of costly, soul-testing struggle. A new textile fiber had come into being.

The picture in 1939 was this. We had the four major natural fibers—wool, cotton, flax, and silk. We had the then two rayons—viscose and cuprammonium. We had acetate and a struggling infant, a textile fiber from glass. Thus, surprisingly enough, nylon became our ninth fiber. Since then the textile industry has added many more fibers.

Confusing? In a way, I'll agree there is confusion, but it's not the tragic type that follows disaster as too many unrealistic people would believe. In reality, it's the wide-eyed, happy confusion of the small boy in a candy shop with his first nickel to spend as he pleases.

Here is the great textile industry which grew with the nation by doing an outstanding job for the greater portion of that period with four natural fibers. Then was added the cellulosic group, and glass, and nylon. Today this industry finds itself with no less than 20—some exciting, basic tools with which to work.

No single fiber is qualified to satisfy all of our present-day needs. The once-popular idea of selling a fabric as 100 per cent of this or that is becoming less and less important. Just as alloys are blended for specific applications, so are more and more fibers being blended to produce fabrics for specific functions and performance.

Furthermore, textile research is showing that the newer chemical fibers are more and more complementary to the natural fibers, as they are to the cellulosics, when used in blends and combinations.

This bears a striking resemblance to great developments in the metallurgical industry which have opened new avenues of enterprise in manufacturing, transportation, and construction.

Without alloys of iron and manganese, chromium, and tungsten, these industries could not have made the great progress they have made. Alloys of titanium with iron, and aluminum with chromium are solving many problems in aviation. No single alloy could do the job alone. Similarly, no single fiber is qualified to satisfy all of our present-day textile needs.

In using the newer fibers, particularly in blends, the approach on some occasions has been on a haphazard basis. This is both needless and unfortunate. The firms that are developing sound fabrics are approaching their problems through engineering.

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Improved Fabrics Through Blending

By E. K. Bispham
Textile Fibers Department
E. I. du Pont de Nemours & Company, Inc.

Today, the textile industry has 20-some fibers to use as tools in engineering fabrics. There are the natural fibers—wool, cotton, silk, and flax. There are the cellulosic fibers—viscose rayon, cuprammonium rayon often known as Bemberg rayon, acetate, and "Arnel" tri-acetate. The newest fiber tools as a family are the synthetic or chemical fibers such as nylon, "Dacron" polyester fiber, "Orlon" acrylic, "Acrilan," Dynel, and saran to name a few.

With the 20-some fibers available today, well over one million blends are possible. There is no simple prescription for the blending of these fibers. It is necessary to test each fabric construction in a proposed end use to determine its suitability for the specific use in question.

There is no such thing as a perfect, an all-purpose, or "miracle" fiber or fabric. Nothing is perfect, nothing is all purpose, and those truisms apply as much to fibers as to all other things.

In blending, the object is to retain the best advantages of the blending components and minimize the less desirable features of each component in order to create a product of the most value.

I would like now to discuss some of the better known and consumer accepted blends of chemical fibers with cellulosic and natural fibers:

65 per cent or more "Dacron" polyester fiber with cotton—This is a highly accepted blend in summer suits, shirts, blouses, dresses, and lingerie. When properly constructed, such garments offer ease of care features such as wash and wear, durability, wrinkle resistance, and shape retention because of the high content of "Dacron." At the same time the cotton reduces the possibility of static charges building up and of hole melting and lends some of its own desirable characteristics of absorbency, texture, handle, and of course lower cost. Reducing the amount of "Dacron" in the blend will result in loss of functionality—giving a fabric which is no longer wash and wear and less wrinkle resistant. Increasing the amount of "Dacron" polyester fiber in the blend will add functionality, but at the same time cotton's contribution to the fabric will not be as great.

55 per cent or more "Dacron" with rayon — In blends, "Dacron" and rayon are very compatible. The "Dacron" contributes durability and ease of care which are lacking with rayon. Rayon, on the other hand, complements "Dacron" since it does not generate static and it adds resistance to hole melting. For some uses, blends of "Dacron" and rayon do not have quite as good aesthetics as blends of "Dacron" and wool; however, noteworthy advances have been made with these blends. Also, as one might expect, the price tag is smaller. I want to emphasize that a minimum of 55 per cent "Dacron" is needed in blends with rayon before the contributions of "Dacron" can be expected to show. These blends are becoming of increasing importance in slacks, suits and uniforms.

50 per cent or more "Dacron" with wool—At the blend level of 50 per cent "Dacron" and 50 per cent wool, excellent lightweight suiting and dress fabrics may be obtained. Many stores are finding tropical worsted-type suits containing 50, 55, or 60 per cent "Dacron" with wool are their best selling spring suits. Wool is excellent in its aesthetic characteristics of handle, texture, liveliness, and bulk. It is generally accepted as having a high level of performance and beauty. "Dacron," properly blended with wool, produces fabrics that combine excellent aesthetic character with outstanding wrinkle resistance, press retention, and durability.

80 per cent "Orlon" acrylic fiber and 20 per cent wool—This is a very popular blend in jersey knit goods. The wool permits cross-dyeing coloration effects. It contributes a difference in handle and texture when compared to jersey of 100 per cent "Orlon" acrylic fiber. The "Orlon" contributes its own luxurious "hand," plus functionality — wash and wear

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55 per cent or more "Orlon" with wool—This blend is used in woven fabrics. "Orlon" is inherently a soft fiber and this property is used to advantage in blends with wool to make soft tweeds, shetland types, flannels, and fleeces. The wool imparts its own aesthetics, such as texture and drape.

15 per cent or more nylon with wool, cotton or rayon—A small percentage of an exceptionally strong and abrasion resistant fiber, of which nylon is the outstanding example, is often blended with weaker, less abrasion resistant fibers such as cotton, rayon, and wool to obtain a fabric with greater wear life. For example, the addition of 20 per cent nylon to a wool carpet will add 30 to 50 per cent wear life over a similar all wool carpet. Cotton twill fabrics, such as denim work clothes, containing 25 per cent nylon blended with the cotton in the warp yarns will wear twice as long as 100 per cent cotton denims in the same constructions.

I wish to stress that small percentages of the tough, new chemical fibers do not impart to any substantial degree their potential functional characteristics other than additional wear life. Unfortunately, many claims which are not true are often made for fabrics containing small percentages of high property chemical fibers such as "Dacron" polyester fiber and nylon. One example of this is rayon carpeting containing 10 per cent or less nylon being sold as 100 per cent nylon, or being sold as having many of the outstanding characteristics of all nylon carpeting.

We have seen how several blend fibers may be combined to emphasize the desirable attributes of each to produce fabrics far above those attainable with either fiber alone.

The selection of fibers and blend levels is very important, but it is by no means the whole story. The job of bringing these fabrics to the consumer requires a great deal more. The best selection of fibers will accomplish nothing unless the weavers, knitters, and converters thoroughly understand the materials with which they are working. That is why we have an extensive technical service program — to work with these mills and manufacturers to produce good merchandise.

The final link in the chain is sound advertising, promotion, and distribution. The ultimate consumer is dependent upon the fiber producer, fabric manufacturer, and the cutter for the quality of his purchase. He is even more dependent upon the retailer and sound advertising to protect his interests, and to educate him on the performance he may expect of his textile end products.

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Cotton Textiles and the Future

by
W. Gaines Huguley, President
F. W. Poe Manuafcturing Co., Greenville, S. C.

No segment of the textile industry seems to be without problems these days. Several years of tough sledding, plus a lot of publicity about poor profits, Japanese competition and other negative factors, may have many people wondering if there **is** a future for textiles.

Definitely there is a future, a great one in my opinion. We have had severe problems, many of which are still unsolved. But present problems are not perpetual problems, and the long-range prospects for the textile industry are excellent.

Textiles is one of America's most important basic industries. More than two million people, including apparel industry employees, make their living in it. About 13 per cent of **all** manufacturing employees in the nation are engaged in textile or related production. Here in the South, our industry is in the forefront as an employer, wage payer and tax payer.

Take away the textile industry, and the economy of the South would collapse over night. And 24 hours later the entire nation would forget atomic bombs and outer space in a desperate effort to resurrect an industry we cannot do without.

So there is a future, a good future for textiles, and as long as we have textiles, we will have cotton textiles, too. The "battle of the fibers" which used to be a popular phrase, has tended more and more toward the "marriage of the fibers." It is getting hard to find mills that are strictly "cotton" or strictly "synthetic" as blends of fibers have become increasingly popular and important.

This does not detract from cotton, but opens up new possibilities for it in my opinion. The cotton industry, from grower to broker, is dependent on the textile industry, and vice versa. Therefore, they will jointly work out such problems as exist for them today.

Here in South Carolina we produce about 40 per cent of all the cotton fabrics in the United States. We have 31 per cent of the cotton spidles and 36 per cent of the cotton looms. In the South as a whole, we already have over 90 percent of the broadwoven cotton fabric production, 72 per cent of the man-made and silk fabric production, and I would guess we are approaching approximately half of the woolen and worsted fabric production.

So we are a tremendous cotton-using country, and will continue to be. It is true that consumption of the man-made (synthetic) fibers has increased. Yet the rapid increase of our population, the new uses for fibers and textile products of all kinds, will inevitably benefit cotton as well as man-made textiles.

This is not to say that we can sit back and wait for something nice to happen. If cottons are to survive the competition from other fibers, additional research and development and far greater **promotion** must be undertaken. We, as is true of all phases of our industry, must deliberately plan on how to regain the share of the consumer dollar which used to go to textiles. In the past seven years, Americans increased their spending for durable goods, services, etc., by about 35 per cent—but consumption of clothing, shoes and related items went up a meager four per cent.

So the declining share of the consumer dollar spent for textiles is indeed a problem, and one that challenges the industry to come up with a vast program of promotion and **merchandising** which will increase purchases of our products.

It is reasonable to assume that just offering the same old products will not do the trick, no matter how well the are promoted. We must develop **new** and **better** fabrics, new constructions, styles, blends, dyes, finishes. Brainwork is required. Scientists chemists, technicians and specialists will work side by side with production men. Designers and stylists will team up with the sales force and mill men.

The net result, as always in this fabulous American economic system of our, will have to be better, more attractive, more serviceable products at prices the public will pay. It will mean that the efficient and imaginative producer will continue to survive as the inefficient and inflexible drop out. It means competition to an even greater extent than we have known it in the past.

It also means that the textile industry, in all its many segments, must have top-flight young intelligent manpower. I am constantly amazed to hear about declining enrollments in textile schools. There is **no** industry which offers greater opportunity for satisfying and rewarding careers than textiles. We need a great bulk of good, substantial average people, of course, but the desperate need continues to be for the exceptional student, the **above-average** young people who can come into the industry and work themselves steadily upward into positions of high line and staff management.

In Burlington Industries, parent company of the organization of which my company is a part, the matter of management development is of primary importance. Not only textile graduates, but graduates whose interests run to administration, sales, personnel and industrial relations, industrial engineering, and other specific areas of staff services or manufacturing are constantly sought.

Burlington, which began in 1923 as a rayon weaver and has always been a noted producer of synthetics, has in recent years expanded its operations into the cotton field. It, too, believes in the future of cotton textiles.

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The Future of Wool

By George Bailey
Clemson '50
Wellman Combing Company

Long before the dawn of history, the Stone Age hunter realized that the fleece of wild sheep was softer, warmer and thicker than the hairy skins of other animals. With this discovery, he made one of the major contributions to human progress.

Most of us now use wool through the year as a matter of course. The use may be in a coat or suit, socks, sweaters, upholstery, rugs, and blankets. Whatever the use, we use wool without even realizing why we've chosen it, but more likely because "virgin wool" or "all wool" on a label has always connoted security, comfort, "the best."

No other fiber behaves like wool and that is why an item made from wool serves so well. The wool fiber has many unique properties, one being elasticity. It can be pulled as much as 30% beyond its normal length or it can be crumpled tight and when released, it will rapidly recover its natural shape and size. The same thing happens with wool fabrics, which may be temporarily distorted in ordinary wear and yet, after hanging in an airy space, return to their previous shape and thickness of texture.

Wool fibers are capable of soaking up as much as 30% of its weight in moisture without feeling damp. This makes wool fabrics more comfortable to wear, because it drinks up perspiration in warm weather and absorbs, instead of transmits, the cold dampness of winter air.

Tightly-woven wool can insulate the body from both extremes of temperature. The best example of its versatility is the use given wool by Desert Arabs who wear wool in turbans and burnooses to protect themselves from the extremely hot, dry air and the fierce mid-day sun, as well as from the sudden cold of the desert night.

The unique virtues that wool possesses such as softness, warmth to the touch, resilience, resistance to creasing, durability and recovery from strain, keep it forever in the light. The obituaries for wool continue to be premature. The old miracle fiber has been thought about to die many times with the introduction of a new fiber by the man-made fiber industry.

Chemists have chased one property after another in their search for a wool-like fiber, but with practically no success in obtaining a likeness to wool. **Nothing measures up to wool!**

It is evident that producers of synthetics would like to avoid using wool altogether in their blends, but to date, such efforts have met with little success mainly on the score of resilience and handle contributed by wool to woven fabrics. Synthetics have undoubtedly established themselves in the field of textile fibers, because in terms of annual production tonnage, they now rank higher than wool.

For the past ten years the American Wool Textile Industry has suffered a 50% contraction, but the future now looks better than ever. It is now evident that the industry's capacity either is, or soon will be, in approximate balance with demand. Such a balance can only lead to greater stability and profitable operations for the plants now existing.

With the introduction of synthetics, growers and processors have intensified their research in the wool and wool textile fields with very encouraging results. A vast research program is going on all over the world today in an effort to provide manufacturers with more uniform qualities of wool and economic processes to produce better wool fabrics to suit specific end uses.

Promoters of synthetics had a "field day" when they spot lighted certain disadvantages of wool such as shrinkage, creasing and insect attack. However, such disadvantages were soon overcome and wool came into a much better position to face competition.

One of the first of these mentioned disadvantages to be overcome was shrinkage and another was moth-proofing. Moth-proofing is now available and is being used in plants throughout the world. Now it is possible to have wool garments that are chemically treated and so labeled that they no longer must be stored away for the summer.

To offset the creasing problem, a method provisionally patented with the trade mark "Si-Ro-Set", is registered and licensed to approved firms to use both the process and the trade mark. This process will thoroughly crease and pleat woolen fabrics.

Along with these accomplishments new and improved scouring techniques are being tested and dielectric heating is being tried to decompose vegetable matter. The full extent of research in America and abroad has to be seen to be appreciated.

With all of this in mind, what has happened to wool in relation to the many man-made fibers which have become a major part of the textile industry?

What really brought about such a change? More than anything else, fashion changes and dress habits have brought havoc with worsteds. The population is dressing more casual the year around and "wash and wear" fabrics are growing in popularity. Fabrics are becoming lighter in weight. Fashion changes have set the pace. Many types of clothing previously made of wool are now made of cotton, rayon, acetate and other man-made fibers or a combination or blends of these fibers. Not forgetting of course, that wool blends are steadily climbing and staying ahead of other blends.

One of today's most successful fabrics is made from 50-50 dacron-wool blends. This blend can be spun on either the cotton or the worsted system. Topmakers have contributed to the industry top-breaking machines that make it possible to blend wool with synthetics and process it on a cotton or a modified cotton system. The price of these blends spun on the cotton system is lower than for those spun on the worsted system. Although fabrics of this blend made from yarns spun on the worsted system are better and more desirable, they may not be enough better to justify the price increase that is necessary when the yarn is spun on the worsted system.

Yarns of special qualities can be produced by blending wool with high and low shrinkage components in the same yarn. When the material made from this yarn is treated with steam or boiling water, the high shrinkage fibers shrink and the diameter of the yarn increases and gives the yarn its lofty and bulky appearance.

For certain purposes, for example, for hosiery, it is now generally recognized that wool blended with synthetics performs better than pure wool. However, blends of dacron with rayon, wool, orlon or cotton are being worn for men's summer suitings and are exploited to the utmost by means of window displays, press publicity, radio and television. Most of these fabrics are inferior in handle to pure wool. However, their promoted advantages and lower price make them attractive to the customer.

It cannot be overlooked that there are today many man-made fibers that surpass the durability of wool, or its strength, and also fibers that are inherently incapable of shrinking and are absolutely moth proof. But try as they may, so far man has not produced a fiber that even remotely resembles wool. It is for this reason that wool fits so well into the various blends.

Lest we forget, wool is still universally esteemed and the high favor in which it is held cannot be ruled out of any consideration of its lasting value. Other things being equal, we know, people will continue to buy wool simply because they prefer it and because it offers comforts that cannot be obtained through other fibers.

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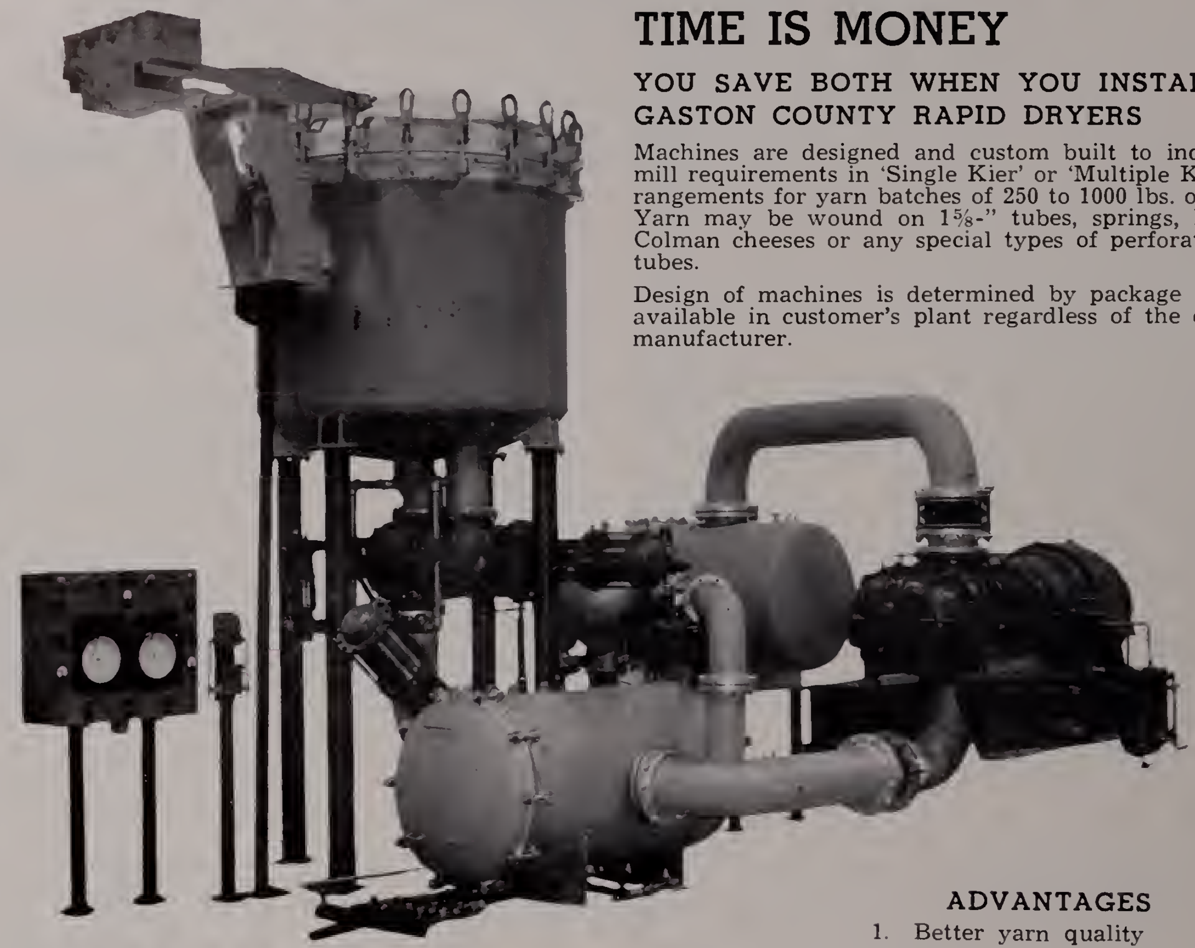

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Outstanding Seniors . . .

Charles E. Griffin, Jr., is a Textile Manufacturing major from Forest City, N. C. Everett has become familiar to the readers of this magazine by his outstanding efforts as Editor of the BOBBIN & BEAKER.

Everett has already gained much experience in the textile field by working at several different mills during his summer vacations. His first experience came at Stonecutter Mills in Spindale, N. C. The next three summers were spent at Laurel Mills in Rutherfordton, N. C. where he worked in the weave room. This past summer was spent at Judson Mills, Greenville, S. C. Here Everett received experience in the Industrial Engineering Department; he plans to enter this phase of textiles upon graduation.

Much of Everett's school activities are tied to his work for THE BOBBIN & BEAKER. He has served as assistant Managing Editor, Managing Editor, and Editor of this magazine. He also is a member of S.A.M., the Council of Club Presidents and the Numeral Society. While in the Numeral Society, he has served as President, Vice-President and has been a member of the Executive Council.

Everett's expenses have been partly covered by a Stonecutter Foundation Loan Scholarship.

William L. Reed, from Whitmire, S. C., is a Textile Engineering major. Bill received scholastic honors the first and second semesters his Freshman year and is now a member of Phi Psi, the textile honor fraternity, and the Society for the Advancement of Management.

Bill has gotten his experience in the textile field by working five years at the J. P. Stevens plant at Whitmire. He has also worked with the Gaffney Manufacturing Co., Gaffney, S. C., and the Dow Chemical Company, Pittsburg, California.

Before enrolling at Clemson, Bill served a four year tour in the U. S. Air Force. Since entering the Textile School, he has been aided in his school expenses by an American Viscose Scholarship.

William H. Dill, a Textile Manufacturing major, is one of our many veterans attending Clemson under the G.I. Bill. He and his wife are presently making their home on the Clemson College Campus.

Bill received scholastic honors the first and second semesters his Junior year and the first semester his Senior year. He has been a member of Phi Psi, the Textile School honorary fraternity, and is now Vice-President of the local chapter.

Bill's experience in the textile industry was gained by fourteen months of work for J. P. Stevens & Company at Slater, S. C. He plans to return upon graduation and work in the production phase of this mill.

Properties and Uses of Arnel in Spun Yarn Blends with Cotton

by
H. F. Elsom

SUMMARY

The basic fiber characteristics of Arnel including low moisture absorption, high initial elastic modulus in a hot wet condition, permanent pleatability, improved alkaline resistance over acetate, and excellent dimensional stability contribute to the possibility of constructing fabrics from spun yarn blends of Arnel with cotton which possess ease of care features combined with unique color styling effects.

Blends of Arnel with cotton may be processed on conventional cotton spinning and weaving equipment using either draw frame or picker lap blends. The spun yarn count limit for weaveable warp yarns is in the range of 20-25/1 using 50% Arnel with combed cotton.

Continuous dyeing procedures for dyeing Arnel in blends with cotton using cotton dyehouse equipment have been developed.

Possible functional application for spun yarn blends of Arnel with cotton include flannel sport shirting, pleated skirts, poplin rainwear, chino slacks, bath robes, walking shorts, women's suiting and suit coating and dress goods. Blends of low percentages of Arnel (20%) with cotton in conventional cotton fabrics such as broadcloths, poplins, print cloth, and soft filled sheetings offer unique color design at low costs.

FUNCTIONAL PROPERTIES

Several important physical and chemical properties of Arnel triacetate contribute to the functional and aesthetic characteristics of fabrics and garments constructed from blends of Arnel with cotton.

Arnel's low moisture absorption, high initial elastic modulus in a hot wet state, the ability to be permanently pleated or creased and excellent dimensional stability contribute to the ease of care features of garments made from blends with cotton. The high resistance of Arnel to alkaline saponification permits compatible wet processing with cotton using slightly modified cotton bleaching formulations.

Figure 1 illustrates the comparative Initial Tensile Modulus for several fibers at various hot wet temperatures. The resistance of Arnel to stretch in a hot wet state is one of several factors important to making garments which resist wrinkling or distortion during laundering. Figure 2 shows the amount of water remaining in various fibers after being wet out and centrifuged for 30 seconds. Low moisture absorption in a saturated condition contributes to faster drying when garments are either drip dried or tumble dried. Figure 3 shows the "drip dry" time for for a series of identically constructed fabrics

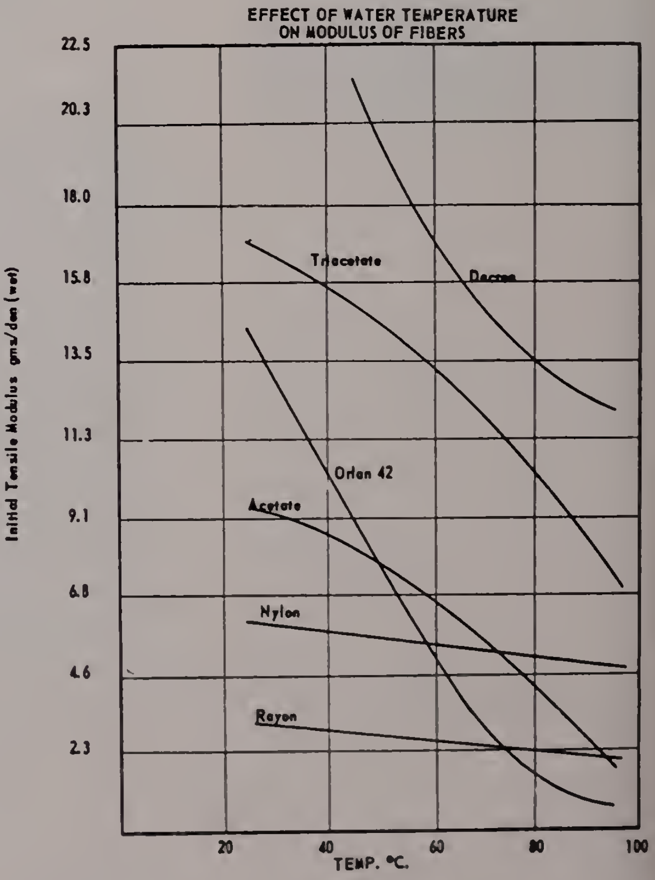


Figure 1

(Journal of the Textile Institute 48, No. 6, June, 1957, p. T198)

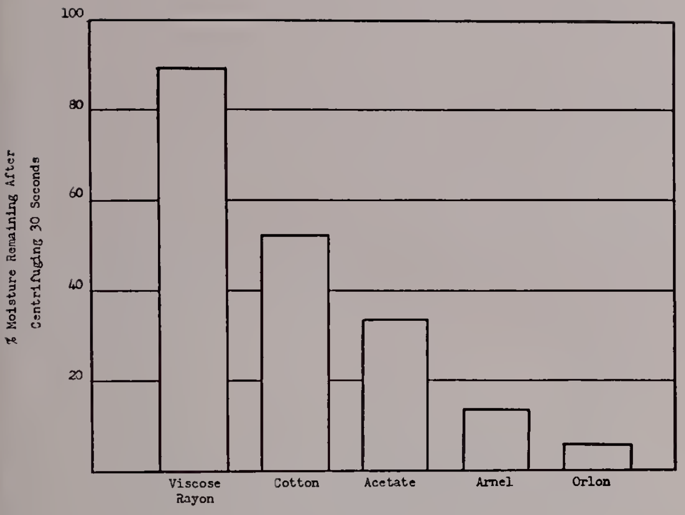


FIGURE 2
Moisture Present After Centrifuging

made from various blends of Arnel and cotton. Note that 100% Arnel dries in about one half the time required for all cotton fabric.

Examples of ease of care features of Arnel when blended with various percentages of cotton are shown in Figure 4. It is seen that garments constructed from properly designed fabrics containing 50% or more of Arnel show excellent pleat and crease retention after multiple washing cycles and tumble drying without ironing. The resistance to normal wrinkling as a result of wear is almost directly proportional to the quantity of Arnel present.

AESTHETIC CHARACTERISTICS

In addition to the functional features of Arnel in blends with cotton, the use of these blends offers an excellent opportunity to achieve unique color styling effects at very low costs. The high alkaline resistance of Arnel permits blends of Arnel and cotton to be handled on continuous cotton-processing equipment including mercerization, buffered peroxide bleaching, and continuous dyeing. A recently developed procedure adaptable to many cotton dyehouses now permits Arnel in blends with cotton to be continuously dyed in either one or two passes on a pad steam range in order to produce one color on Arnel and a contrasting color on cotton.

These color styling possibilities are particularly applicable to blends of 20-30% Arnel with 70-80% cotton in conventional cotton fabrics such as print cloths, broadcloths, lawns, soft filled sheetings and poplins. The fabrics may then be overprinted or resin finished as required.

Such fabrics afford the cotton textile manufacturer a unique opportunity to upgrade highly competitive cotton textile fabrics at a minimum increase in manufacturing costs.

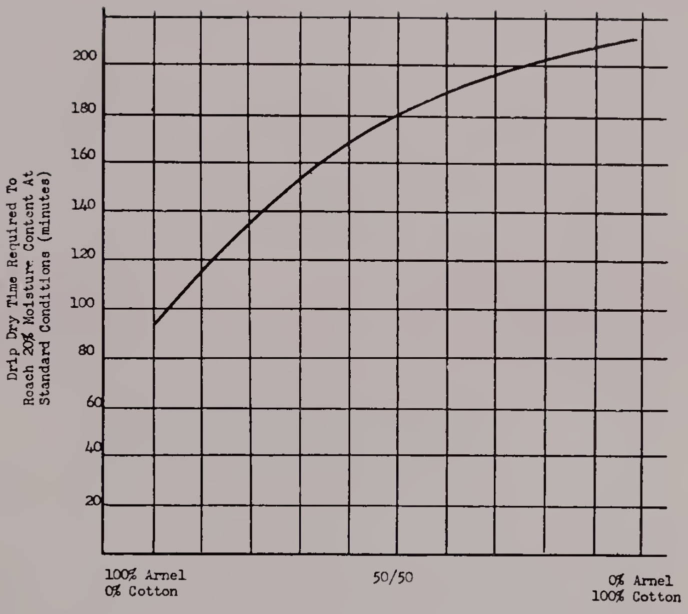


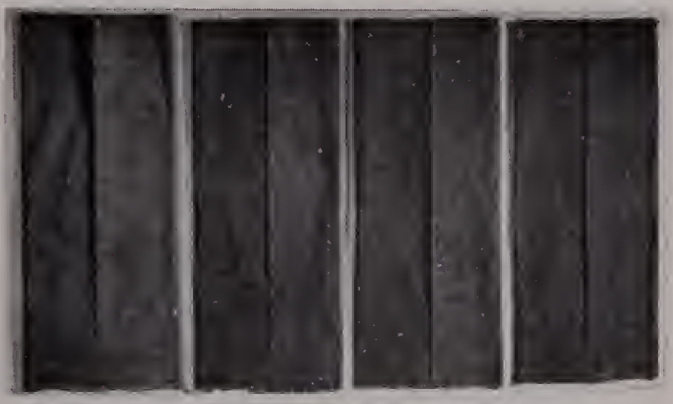
FIGURE 3

Drip Dry Time
versus
Fiber Content

PROCESSING CHARACTERISTICS

Yarn Spinning — The manufacture of spun yarn blends of Arnel and cotton has been accomplished either by preparing draw frame blends or by sandwich blending on a finisher picker and carding the blend together. In either event, it has been found advantageous to employ Arnel of similar cut length to cotton staple length so as to obtain adequate control on drawing frames. Draw frame blends have been prepared by processing through 3 drawings to assure adequate blending.

Weaving — The weaving of spun yarn blends of Arnel with cotton poses no special problems except as regards spun yarn count limits and proper design of fabric construction to obtain desired finished fab-



70/30 Arnel/Cotton | 60/40 Arnel/Cotton | 50/50 Arnel/Cotton | 30/70 Arnel/Cotton

Figure 4

Appearance of Creased Trouser
Leg After Machine Laundering
(5 Cycles)

ric constructions. As a general guide the approximately maximum weaveable warp yarn counts are shown below:

Blend Ration	Suggested Maximum
2.5 d x 1-1/2" Brt. Arnel	
1-3/16" S. M. Combed Cotton	**Warp Yarn Count**
70% Arnel/30% Cotton	18/1
50% Arnel/50% Cotton	25/1
20% Arnel/80% Cotton	50/1

Conventional starch sizes or water soluble sizes consisting of Penford Gum and Polyvinyl alcohol have been found to process satisfactorily.

DYEING AND FINISHING

Blends of Arnel and cotton may either be dyed and finished by batch procedures in typical synthetic dyehouses or by continuous procedures in cotton dyeing and finishing equipment.

Synthetic dyehouse operations include bleaching and dyeing with selected direct dyes for cotton and selected dispersed acetate dyes for Arnel using a one bath procedure. In fabrics containing 50% or more of Arnel, improved color fastness and added resistance to glazing may be obtained by heat treating the fabrics either over hot rolls or in a radiant heater so as to achieve an approximate fabric surface temperature of 420°F. Fabrics dyed in a synthetic dyehouse operation will pass 120-140°F. color washfastness and 10-30 hour lightfastness depending upon the choice of direct dyes and fixative for the cotton dyed portion.

The most recent process for dyeing Arnel/cotton blends consists of a continuous procedure for mercerization buffered peroxide bleaching, and continuously dyeing either the Arnel or cotton on a pad steam range. The dispersed acetate color to be applied to Arnel is dissolved in 10-20% triethyl phosphate and padded onto the fabric at 80-90°C., followed by steaming at 115-120°C. for 15-30 seconds, hot water rinsing and soaping using continuous pad steam range equipment in tandum with a Williams unit and wash boxes. The cotton portion may be dyed simultaneously by first padding on Priocion or Cibacron dyes and drying before applying dissolved acetate colors on Arnel. Alternately, the cotton may be vat dyed on continuous equipment with selected dyes after dyeing the Arnel portion. Most of the shades dyed using the vat and selected dispersed acetate colors will pass 140°F. color wash fastness and 20-40 hours fadeometer exposure.

The finishing of Arnel/cotton blends is handled in the same manner as the finishing of cotton using either sanforization, everglaze, CRF, or wash and wear finishes. Heat treatment prior to resin finishing is recommended for those fabrics employing 50% or more of Arnel.

POSSIBLE APPLICATIONS

The preceding discussions illustrate three areas for use of Arnel in spun yarn blends with cotton. These are outlined below:

(1) The use of low blend percentages of Arnel (20%) in conventional cotton fabrics to achieve unique color styling effects on cotton dyehouse continuous dyeing equipment.

(2) The use of about 50% Arnel with cotton in fabrics employing up to 25/1 warp yarn count and in applications not subject to severe wear. The use of Arnel in these fabrics such as skirtings, sport shirtings, poplins, flannels, and gabardines contributes to ease of care and durable pleat and crease retention as well as allowing for versatile color styling using cotton system dyeing.

(3) The use of up to 70% Arnel in blends with cotton for medium to heavy weight goods where wear resistance and strength are not critical factors. Arnel in such applications allows for the construction of ease of care apparel such as women's suitings, skirtings, sport shirts, bath robes, women's suit coatings, and Bermuda shorts.

With the advent of increased technology, expanding consumer experience and unique fabric designs by the textile manufacturers, the use of Arnel in blends with cotton will show continued expansion to supply ease of care garments for the consumer.

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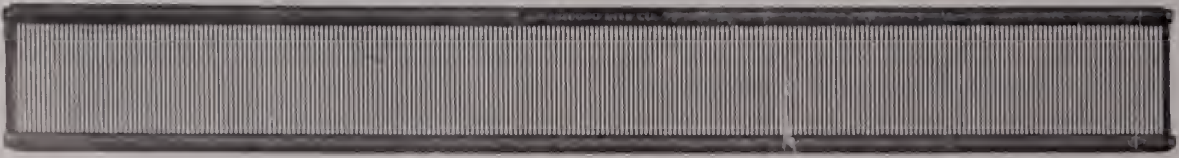

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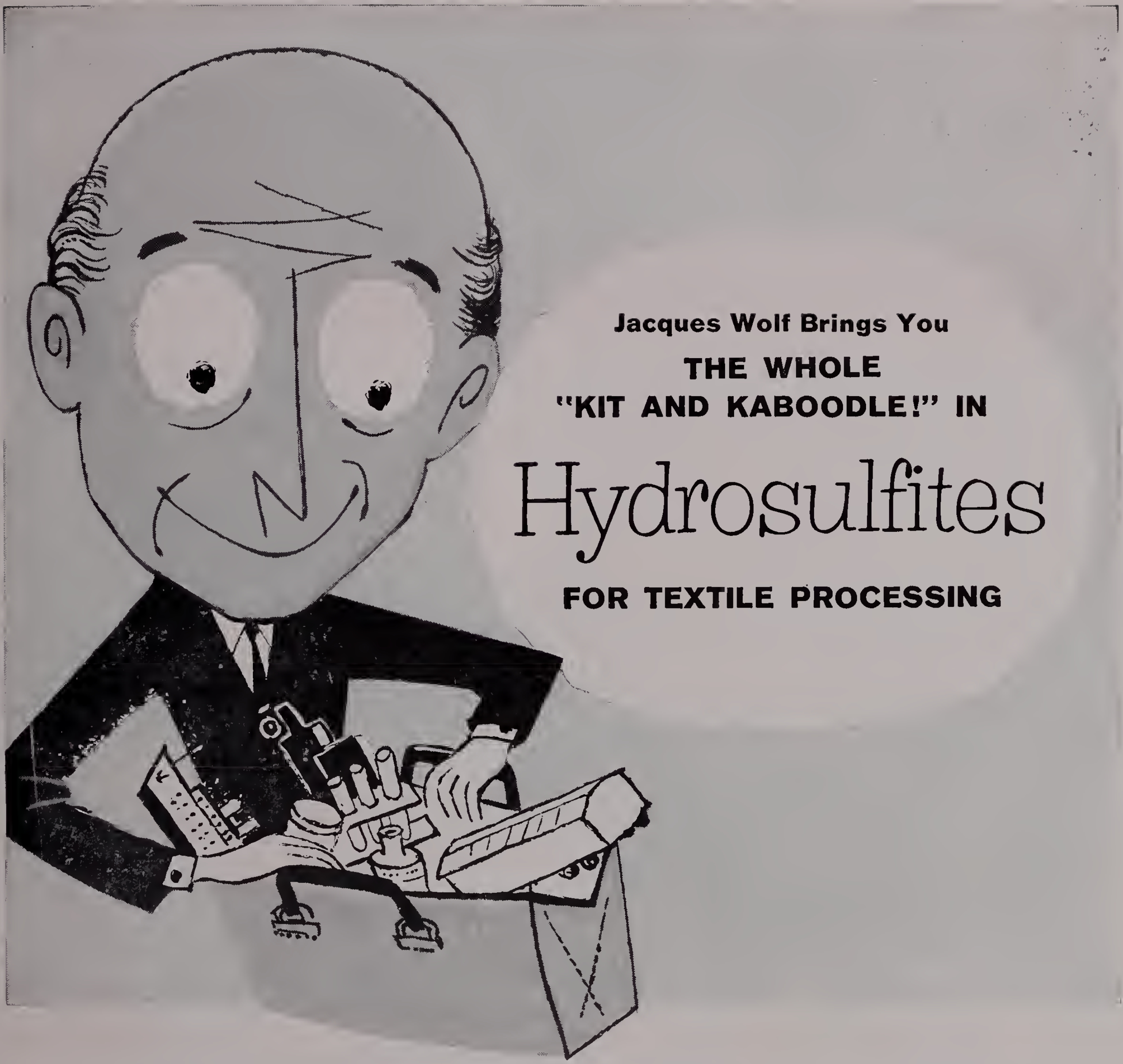

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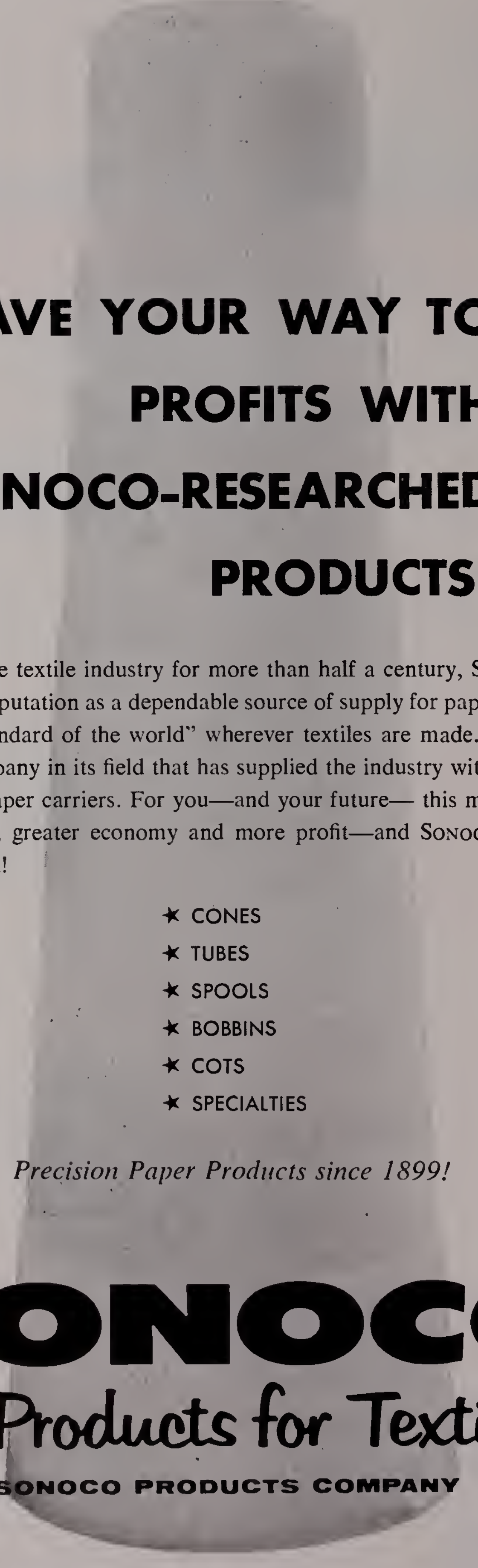

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The 1958-59 "Bobbin and Beaker" staff seated from left to right: Kenneth W. Powers, Business Manager; Joseph M. Fox, Advertising Manager; W. Wayne Freed, Editor; C. Lamar Green, Circulation Manager; J. Alan Bell, Managing Editor.

From The Editor . . .

In keeping with our past policy of featuring a central theme for our magazine, the 1958-1959 staff of the **Bobbin** and **Beaker** brings to you the student, and to you who are in industry, reports and articles from some of the leading textile schools in the United States.

Our features tell a story of the activities centered in and around these institutions which supply the textile industry with the management material and information so vitally needed at the present time.

Statistics, words, and pictures are blended together to show that "Textiles . . . the Field is Unlimited."

—Wayne Freed, Editor

Textiles -- The Field Is Unlimited

Sal Castorina, Ch.E. '60
Georgia Institute of Technology

Reprinted through the Courtesy of the "Georgia Tech Engineer," February 1958 Issue.

Claiming to be the 3rd oldest school on the Georgia Tech campus, the A.French Textile School was established in 1889. This date gives it the right to claim the title of being the first textile school south of the Mason-Dixon line. But textiles, as well as the school, have come a long way in the past 69 years. The textile industry has grown from a southern necessity to a nationwide institution. Textile corporations now take their place in industry side by side with the automotive and railroading giants. More and more high school student are becoming interested in textiles. Some in textile engineering, some in the chemistry of textiles. New techniques, advanced methods, and finer products demand better quarters to insure better textile specialists. As the textile industry grew the A. French Textile School began making plans to move. In 1949 the $1.5 million Harrison Hightower building was ready for occupancy. Included in this "little red schoolhouse," besides its many mill rooms, are eight classrooms, a student lounge, ten offices, a conference room, a library, an auditorium and an exhibition gallery. This massive building does not stand as a teaching aid for a decadent or dying industry. The applications for admission into the textile school are increasing from year to year. There must be a reason. Actually there are many reasons.

Today's high school student is a well-informed person concerning careers and vocation. Heavy stress is placed on the future. Vocational classes are conducted. Guest speakers laud the particular merits of their chosen field. As these students were told, the textile field has much to offer. For those in search of a field of satisfying work, as well as the many desiring to choose a career in a profitable as well as secure industry, textile work carries a loud cry.

An entering Freshman in the textile school has three branches of textile work of which he may choose his preference. Degrees offered in the undergraduate school are Bachelor of Textile Engineering and Bachelor of Science ni Textiles. The latter is further broken into two options, the manufacturing option and the Chemistry and Dyeing option. As a Freshman the curriculum of all three branches is primarily the same. The basic courses of Math, Chemistry, English, Engineering Drawing and Modern Language or Social Science are taken by all. But in his Sophomore year specializations begin. Perhaps we had better pause here and clarify one item. The idea may have been given that textile work is strictly for men. The masculine pronoun is used solely for convenience. The number of women studying Textile Engineering and Textile Chemistry is growing yearly.

In his Sophomore year the textile engineer begins studying in his department with Fabric Design and Fabric Analysis along with the basic Sophomore courses of Calculus, Physics and English. Surprisingly enough, in his Junior year he takes only two courses in his department., Yarn Manufacturing and Weaving. The remainder of his curriculum is filled with courses in other schools. Thermodynamics and Industrial Marketing are two of these subjects designed to give this engineer the background necessary for a succesful career in today's complex industry. But in his Senior year nine different courses are scheduled in his department along with a number of other courses, such as Technical Writing and Industrial Psychology.

The program for a B.S. in Textiles in the Chemistry and Dyeing Option is different in the amount of courses taken in the School of Chemistry. Analytical, Organic, and Physical Chemistry constitute a portion of a Sophomore and Junior's interest in Chemistry. Along with his chemical courses, then and also when he is a Senior, come many classes ni bleaching and dyeing. These are supplemented by courses similar to the extras of the Textile Engineering program, Technical Writing and Industrial Psychology.

A student in the manufacturing option begins his specialization in his Sophomore year with Yarn Manufacturing. Highlighting his Junior year are such courses as Organic Chemistry, Weaving, Industrial Marketing. These are followed the coming year with Cotton Classing, Physical Textile Testing and other allied subjects.

But all of this textile student's education is not learned in the classroom. Many hours are spent in the lab or mill rooms. Practical work constitutes a very important phase of a textile student's education. Work with actual looms, yarn and knitting machines is necessary for three options. Supplementing these labs are frequent field trips to nearby textile mills.

(Continued on page 20)

It's Your Future -- Choose It Wisely

By

Alan Bell, TE '60
Clemson College

You are approaching the final phase of preparation for your life's work. As you look toward a college education, you must make decisions that will determine your entire future—be realistic—consider the facts—do not be swayed by impractical dreams or influenced by passing fads.

Would you like to be part of an industry which employs more than two-thirds of all the manufacturing personnel in South Carolina, provides more than two-thirds of the manufacturing payroll in the state, gives employment to over 130,000 South Carolinians earning in excess of $400,000,000 annually? The 325 plants in South Carolina are valued at fifteen percent of the state's total assessed property. Of course this is the textile industry, the industry which produces 63 percent of this state's gross annual manufactured products which amounted to more than $1,700,000,000 last year.

South Carolina accounts for more than 34 percent of the active textile spindle hours in the United States, and at the same time consumes more than 28 percent of all the cotton used by textile mills. In addition to the mills in South Carolina there are textile mills located in 40 of the 48 states. The total number of textile mills in the United States is approximately 8,000. These plants employ some 1,000,000 persons who earn approximately $3,300,000,000 annually.

In 1957 the textile industry ranked sixth in size by employment, ninth by assets, and ninth by sales. These figures prove that the textile industry is not only basic to our state economy but also to our national economy. Taken together with the garment and allied industries it ranks first in industrial employment.

The textile industry is located chiefly in the heart of the south-lands. Three states, North Carolina, South Carolina, and Georgia have the majority of the mills with other southern states giving them help. Why this location in the south? Here trained labor is available, cheap power is plentiful, there is room for expansion and reasonable taxes are some of the answers.

Opportunity for rapid advancement is exceptional for trained personnel. In few industries will you find as many young men holding key positions as in the textile industry. Starting salaries in the textile industry are high. Textile executives seem to get to the top sooner, to stay there longer, and to be paid better than those in most other industries.

The number of Textile graduates is small in comparison to the number needed by the textile industry. A textile graduate has a wide and varied choice of jobs. In the past several years, almost every Clemson Textile Graduate has had from 5 to 10 job offers. A recent survey shows that about five times as many textile graduates will be needed in the next ten years as present enrollment indicates will be available.

Many textile plants offer training programs to college graduates which may consists of several months of actual training in the mill before any definite assignment is made. Few other industries offer training this valuable to new employees.

Those entering the textile field are not restricted to one phase of the industry, but are usually tried in several departments to determine where they will best fit into the organization. This may include: yarn manufacturing (cotton, wool, silk blends), synthetic fiber manufacturing, textile machinery manufacturing, dyeing, finishing, costing, research, design, quality control, sales, personnel, textile chemicals and supplies, advertising, writing, teaching, textile specialties and many others.

The textile industry has problems—all industries do. That is one of the reasons why top level executives are interested in college and technically trained men. They need them to keep their plants ahead.

To an industry that has duplicated the work of the silk worm, the wool of the sheep and developed new and unheard of fibers, very few things are impossible if college graduates, trained in methods of research and development are available. Most mills have their own research departments now, where new methods and processes are developed.

Yesterday was the day of the technician in the textile industry — the mechanic who developed new ways of spinning. Today is the day of the research worker and the chemist. These are the laboratory workers who discover new ways to do new things and who open new horizons to designers, manufacturers, and retailers.

It takes all kinds of men to fill the needs of the textile industry, there is a place for every man. There is a place in textiles for the man who likes machines, there is a place for the person who likes people or mathematics or research. Others who do not like the technical end of textiles may find their place in the management of personnel fields. No matter what your interests, more than likely you can find a job to suit you in the diversified field of textiles. You can find opportunities to increase your education and prepare yourself for promotion.

There are excellent career opportunities for women in textiles. About 35% of the textile workers in the south are women. The pay rate is generally equal to that of men doing the same work. Within a few months women may expect to be earning higher wages than in any other industry with equal training. Many women are holding key position with textile firms.

The field of chemistry offers a good chance in laboratory work and research. A woman with some artistic inclination may go far as a designer. Personnel work is a wide open field for women, but few girls go very far in the supervisory fields of production.

Women with formal textile training and a knowledge of shorthand and typing can have their pick of the choice secretarial jobs.

Why go far afield to some unproved occupation when the textile industry is here at home? Consider the opportunities offered by this industry before making a final decision. The need for office supervisory workers has advanced greatly. White collar workers are about as numerous as blue collar workers. This trend emphasizes the need for trained personnel with increased income.

There are ten schools in the United States that offer textiles as a major course of study. Technological advances make the college trained man more desirable and the one with a textile background even more so.

There are about 8,000 Textile Plants plus many related fields competing for the services of these graduates. With a decreasing supply and an increasing demand, where are your executives and production men to come from?

Clemson College has one of the finest textile schools in the world for you. Clemson at present has three curricula in textiles which cover almost every phase of cloth manufacture from the processing of the raw materials to the completion of the finished product. Within the scope of Textile Manufacturing, Textile Science, or Textile Chemistry you will find the training to prepare you for many phases which may interest you.

Each of the three curricula offered combines detailed technical training with sound liberal education to give you a broad background for a successful career. The day of the narrow specialist is gone. If you are to serve in any phase of textiles, you must become more than a skilled technician. You must have an overall view of the whole field. Upon this philosophy textile education at Clemson is based. A brief description of the three major Textile curricula offered at Clemson follow:

TEXTILE MANUFACTURING

Textile manufacturing prepares you to enter the production and management phases of the textile industry. In this curriculum you learn the general methods of preparing raw materials, spinning them into yarns and weaving these yarns into cloth. You are taught the fundamentals of textile machinery

(Continued on page 21)

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Cotton Research At T. R. I.

By

L. Rebenfeld
Group Leader, Textile Research Institute
Princeton, N. J.

Introduction

During the past ten years Textile Research Institute has conducted a broad program in cotton research aimed at providing for the American cotton industry fundamental knowledge of cotton. Since Textile Research Institute is a research and educational institution, supported by dues from a group of firms within the textile industry and its allied branches, the cotton research program at TRI must be considered as a portion of the cotton industry's investment in fundamental research. Certain aspects of the work have been and are currently being conducted under contract with the U. S. Department of Agriculture. In order that the research program be pertinent to the problems of the cotton industry at all times, over-all guidance is in the hands of the TRI Cotton Research Advisory Committee. This Committee is composed of technical representatives from the sponsoring firms, the U. S. Department of Agriculture, and the National Cotton Council of America. The Committee meets semi-annually with the TRI technical staff in order to discuss the results of past work and to advise in the formulation of the future program. Clearly, the Committee fulfills the dual function of keeping the TRI staff aware of the industry's technical problems, as well as providing the sponsoring organizations with information on the progress of TRI research. The sponsoring organizations are also kept abreast of developments by frequent technical reports which are issued by the Institute. Finally, significant aspects of the work eventually find their way into scientific literature where they become available to the entire cotton industry.

Technology of the cotton industry constitutes a vast, complex structure utilizing the services of biologists, chemists, physicists and engineers. All these fields of science must be called upon to keep the cotton industry operating smoothly, efficiently and competitively. This underlying fact is a result of the technological developments which have taken place during the past two or three decades. These developments range from the spectacular advances of the cotton breeder, who has provided the industry with many new cotton types, to the evolution of a variety of textile finishing processes which produce many useful and interesting effects in the final fabrics. Thus, the term "technology of cotton" is an extremely broad designation and no single organization can possibly undertake to study all the many ramifications that the term includes.

While it has been stated that the broad objective of the TRI cotton research program is to provide fundamental knowledge of cotton, the program must of necessity be oriented to answer certain specific questions. What, then, are some of the phases of the research program which have been carried out in the past as well as those which are now under investigation?

Influence of Fiber Properties

If a student were asked to list the mechanical properties of single cotton fibers, he would be hard put to give a concise answer even for the frequently discussed values of breaking strength, breaking extension and elastic recovery. The inability to give such an answer would not be the result of poor studying habits on the part of the student, but would be due rather to the development of cotton fiber types possessing unique combinations of fiber properties. For example, cottons have been developed whose average single fiber breaking extension in tension is as low as 5%, while other cottons have been grown whose average single fiber breaking extension is as high as 15%. Similarly, average single fiber breaking tenacity values may be made for practically all fiber characteristics. Cotton fiber properties are highly interrelated so that generally cottons with a low fiber extensibility are strong and stiff, whereas cottons with a high fiber extensibility are weak and pliable. While it has been possible for the breeders to develop these cottons with extreme values of certain fiber properties, the question as to the influence of these properties on the characteristics of yarns and fabrics remains to be answered conclusively.

One of the major phases of the TRI cotton research program is the establishment of the influence of cotton fiber properties on the characteristics of cotton textile end products. Experiments of this nature entail the judicious selection of several desirable cotton types and the careful evaluation of the single fiber mechanical properties of the chosen cottons; highly controlled processing of the experimental cottons into standard construction fabrics; and finally, the evaluation of the characteristics of the resultant fabrics. An example of the influence of single fiber breaking strength on the breaking strength of the corresponding fabrics is shown in Figure 1 for six experimental cotton types. It will be noted that the fabric strength increases with increasing fiber strength for five of the cottons, but that the sixth cotton has a lower fabric strength than would be expected on the basis of its single fiber breaking strength. This indicates that fiber strength, though an extremely important fiber characteristic, is not the only factor which determines fabric strength. Some other fiber property, which may or may not be related to fiber strength, plays an important role.

The establishment of this and other relationships between fiber properties and end-product characteristics is an important part of the TRI cotton research program. It is the aim of this portion of the program to provide information which will guide cotton breeders in developing superior fiber types.

Cotton Fiber Structure

Of considerable interest and importance to the textile scientist is a thorough knowledge of the chemical and physical structure of any given fiber and the relationship of the structure to the fiber mechanical properties. As is well known, the cotton fiber is a cellusosic material, and is in fact the purest form of cellulose found in nature. Cellulose is a long chain polymeric carbohydrate material found in virtually all vegetable matter. It has been shown by many investigators that the manner in which the cellulose is arranged within the fiber has a distinct bearing on the chemical, physical and mechanical characteristics of the fiber. Investigations at TRI are constantly under way to establish more clearly and definitely the structure of cotton cellulose. Concurrently investigations are conducted to determine the relationship between certain of the structural parameters and cotton fiber mechanical properties. As an example, the degree of orientation of the cellulose molecules with respect to the fiber axis has been shown to relate to practically all fiber properties. The degree of orientation is most readily evaluated by a parmeter known as the x-ray angle. The relationship between the x-ray angle and the fiber breaking extensibility for 16 experimental cotton types is illustrated in Figure 2. This relationship clearly indicates that a fiber mechanical property, such as the breaking extensibility, is a function of the physical structure of the cellulose comprising approximately 96% of the fiber. Similar relations could be shown for other fiber properties.

Effect of Processing

From the time that the lint is picked in the field to the time that it finds its way into a consumer product, cotton undergoes a wide range of processing operations. Some of these operations are purely mechanical, others purely chemical, and still others require a delicate balance between chemical and mechanical action. The study of the manner in which fiber properties are altered as a result of either mechanical or chemical action constitutes another phase of the TRI cotton research program. For example, it has been found that excessive heating prior to ginning induces certain weakness in the cotton fiber, and that upon subsequent mechanical processing the fibers have a tendency to break. The net result is that excessively heated cotton has a higher percentage of short fibers than a corresponding cotton which had not been subjected to excessive heat. The higher percentage of short fibers results in poorer processing efficiency and a lower end-product quality. The significance of fiber length distribution was thus indicated and, after suitable further verification by other examples, can now be considered as established.

Chemical Receptivity

With the current expansion in chemical finishing and modification of cotton it was thought advisable to initiate a study of the manner in which different cottons respond to chemical reactions. While this phase of the TRI cotton research program is only in initial stages, certain interesting observations have already been made. Foremost amongst these was the evaluation of the manner in which cottons respond to mercerization. This chemical treatment is by far the most common cotton finishing operation. It is carried out either on yarns or on fabrics by the action of concentrated sodium hydroxide solutions while the cotton material is held under sufficient tension to prevent shrinkage. The result of mercerization is to increase strength and luster as well as to increase the ability of the material to absorb other chemicals such as dyes and crease-proofing agents. In laboratory experiments, where single cotton fibers were subjected to the conditions of mercerization, it was observed that different cottons did not respond in the same way to the treatment. One of the most pronounced effects of single fiber mercerization was an increase in the fiber stiffness. This property is measured by the fiber elastic modulus which can be defined as the resistance of the fiber to an initial extension. Cottons with an originally high elastic modulus to the same extent as did cottons with an originally low elastic modulus. Basically this observation indicates the levelling-out effect of mercerization, since the differences among untreated cottons are larger than coresponding differences among mercerized fibers. It should not be inferred that the differences among cottons are eliminated as a result of the mercerization treatment; such differences are still evident although considerably reduced.

Fiber Testing Techniques

Any research program which deals with the study of the mechanical and other properties of cotton fibers must concurrently and constantly strive to develop more efficient methods for evaluating these properties. At the same time the research program must devote a portion of its effort to finding means of testing fiber properties which have hitherto not been evaluated. An example of a fiber characteristic which has not been accorded its fully deserved attention is the fiber surface. Despite the fact that both light and electron microscopy have done a great deal to illucidate the surface structure of cotton and other fibers, many questions remain unanswered in this field. Particularly, one may inquire as to the nature of the fiber surface while the fiber is subjected to conditions such as it might encounter in carding, spinning and other processing operations. In order to shed some light on this seemingly important question, an instrument has been developed at TRI which gives a record of the fiber surface while the fiber is slowly drawn over a sensing element. The signal that is generated and eventually recorded when the fiber is passed over the sensing element comes about from the surface roughness of the fiber but is modified by the physical nature of the fiber. Thus, what is actually being recorded is a combination of the geometric configuration of the fiber surface and the pliability of the fiber. It is felt that this combination of fiber characterictics may be a particularly useful and significant one, since it appears plausible to say that this same combination of properties is brought into play in textile manufacturing operations such as carding, drawing and spinning. The instrument is at this time only in its experimental stage, but indications are that several important observations will be possible with this equipment.

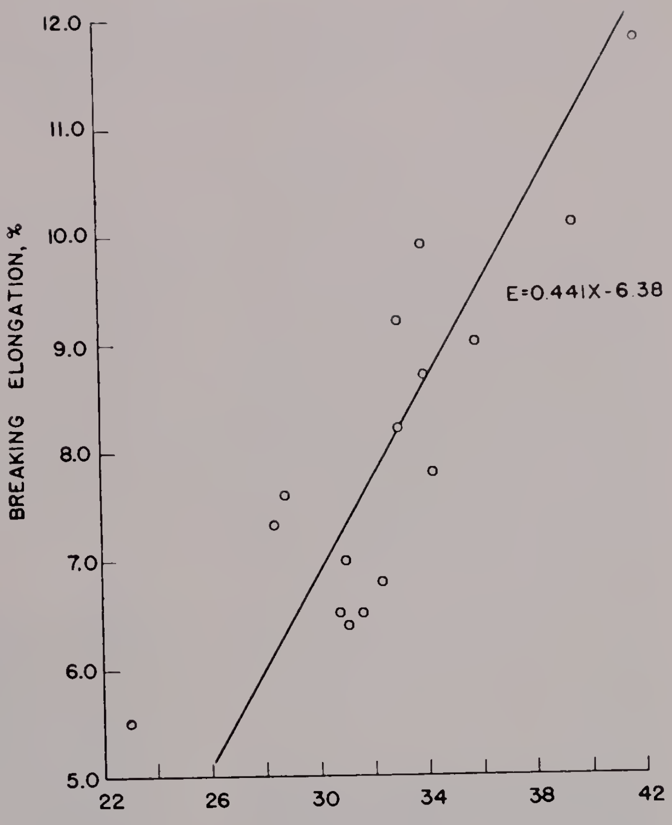

Figure 2

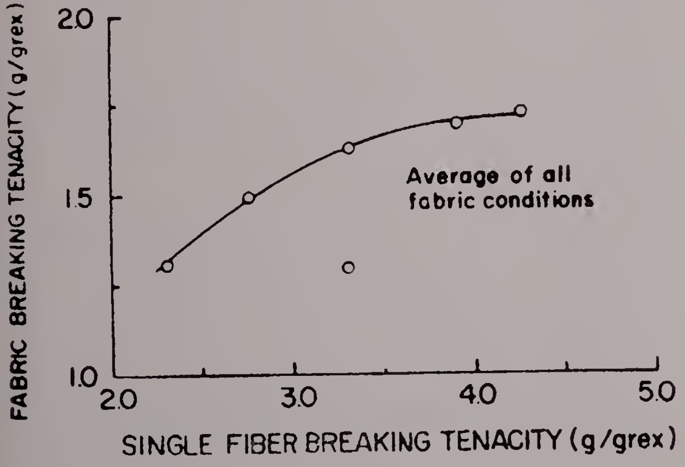

Figure 1

Conclusion

It is impossible in this short space either to present all of the cotton research activities at TRI or to give detailed experimental observations and discussions upon which the conclusions are based. It is hoped, rather, that this article will indicate to the reader the nature of the work which constitutes the TRI cotton research program.

The New Government Spinning Laboratory At Clemson College

By
Harral Young, T.M. '61

The National Cotton Council, an organization to improve the competitive position of cotton in the industrial and agricultural world, has instigated a movement to find the true market value. The Council is made up of farmers, ginners, crushers, merchants, warehousemen, and spinners.

In spinning experimentation up to the present, one of the big problems has been the fact that the experiments have been conducted on too small a scale to get really conclusive data. One of the main things to be studied is the ends down per thousand spindles per hour.

The American Cotton Manufacturers Institute and the National Cotton Council proposed a pilot plant program to the Agricultural Marketing Service of the United States Department of Agriculture. The Marketing Service became interested. After looking over several locations, Clemson was selected. The following plans resulted:

1. The Marketing Service will operate the facilities.
2. Clemson College will serve in a cooperative capacity; space will be provided in Sirrine Hall, and personnel from the textile department will serve on advisory and planning committees.

The physical facilities will consist of four cards, one drawing frame, one eighty-four spindle roving frame, and four spinning frames of two hundred fifty-two spindles each. Space is being left vacant to accommodate a comber which may be added at a later date. The opening and picking equipment of the college will be used. The building facilities will consist of an air-conditioned laboratory and sufficient office space.

In the future the pilot plant may extend into a weaving and finishing department also.

The facilities of the present pilot plant will be used as a service facility by other divisions of the United States Department of Agriculture as well as by local division.

One of the immediate problems is to find how cotton can best be handled between the time it opens in the field and the time it reaches the mill platform. This problem will extend into many phases of harvesting, ginning, packaging, and marketing.

Clemson College is very proud to have been selected to cooperate in this project.

Mr. Gaston Gage, Dean of the School of Textile here at Clemson, says, "I believe as time goes on, the Clemson Colege community will become the cotton research center of the United States and the world."

Gage Appointed Dean of Clemson Textile School

Acting President R. C. Edwards announced Tuesday that the Board of Trustees has named acting dean Gaston Gage, Dean of the School of Textiles.

Dean Gage is a native of Chester and has been acting dean since November 1, 1957. He joined the staff as an instructor in 1932, became associate professor in 1943, and later head of the yarn manufacturing department. He served as an overseer in the card room, spinning room and cloth room at Aragon Baldwin Mills in Chester prior to 1932.

Mr. Gage is a transfer from the University of South Carolina, received the B.S. from Clemson in 1921 and earned the B. Ed, at Penn. State in 1941. He also studied at the University of North Carolina.

Mr. Gage is a member of the American Society for Testing Material; International Organization for Standardization; Technical Committee on Textiles; American Society of Quality Control; National Council for Textile Education and the Textile Institute. He is also a member of the Kappa Alpha, Phi Psi, and other fraternal organizations.

He married the former Ruth Vardell of Red Springs, N. C., and has two sons, Gaston, Jr., of Roeford, N. C., and Charles Vardell, of Jacksonville, Florida. He is chairman of the Pastoral Relations Committee of the Clemson Methodist Church.

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By
Tommy Ariail

Joe Fox, from Inman, South Carolina, is a Textile Chemistry major. Joe has been active in student affairs while at Clemson, and he is now President of the Student Body. Along with his many duties as President, he is Advertising Manager of The BOBBIN AND BEAKER. He is also a member of Blue Key, Tiger Brotherhood, Scabbard and Blade, and Phi Psi.

Joe is a member of the Clemson R.O.T.C. unit in which he now holds the rank of Captain, and he is an S-4 on the 2nd Bn. staff.

He has gained valuable textile experience by working for the last four summers with the Inman Mills of Inman, S. C.

Joe has been helped with his expences here at Clemson by the expenses here at Clemson by the Inman-Riverdale Foundation Scholarship.

W. Wayne Freed, is a Textile Engineering Senior, and he and his wife are now living in Central, South Carolina. Wayne has become familiar to the readers of this magazine by his work on The BOBBIN AND BEAKER of which he is now editor.

He has worked the last three summers as an engineer's aid at the DuPont plant in Aiken, S. C.

Wayne has done a good job on The BOBBIN AND BEAKER staff where he has been Managing Editor and is now Editor. He is also a member of Phi Eta Sigma Fraternity, Phi Psi, N.T.M.S., Council of Club Presidents, and was elected to "Who's Who in American Colleges and Universities" his junior year.

Wayne was awarded the Seydell-Wooley Scholarship his junior year and the American Viscose Scholarship his senior year.

Kenneth W. Powers, Jr., a Textile Senior from Stonington, Me., is one of the most active students on campus. He is a member of Blue Key, Tiger Brotherhood, Scabbard and Blade, Arnold Air Society, Phi Psi, and he is the Business Manager of The BOBBIN AND BEAKER this year. He has also been a member of the Pershing Rifles, Tiger Band, and on "The Tiger" staff. Ken was also awarded the Distinguished Air Force R.O.T.C. Cadet award and at present he is working as Tigerama Skit Chairman.

Ken holds the rank of Cadet Major in the Air Force R.O.T.C., and he is also a Wing Training Officer.

His experience in the textile field has been gained by working two summers at the Wellman Combing Company of Johnsonville, South Carolina.

Ken has been helped with his expenses by the Wellman Foundation Scholarship.

Oven-Drying In Ginning Damages Cotton

By

John Graham
Textile Research Department, School of Textiles
Clemson, S. C.

When cotton gins were less complex, cotton classers could often detect excessive gin damage because rough fiber treatment was frequently accompanied by visible marks of "rough preparation", usually associated with dense seed roll or moist cotton which causes nepiness, seed coat rupture and an abundance of large tangled masses of fiber. With the trend toward rougher harvesting methods has come the modern gin with driers, seed cotton cleaners and lint cleaners. Over 80% of the gins in the United States have drying equipment. It is recommended that cotton not be dried below 5% moisture in ginning, and 7% moisture is considered optimum for preserving the fiber quality. It has been estimated that 4/5 of the Delta cotton crop is ginned with less than 6% moisture. The number of bales penalized annually for rough preparation has dropped to less than 5%.

From the manufacturer's point of view cotton ginned too dry may be worse than cotton ginned too wet. because the cotton classer cannot look at a sample of cotton that was ginned too dry and tell how dry it was ginned or to what extent, if any, ginning in the dry state has damaged the fiber, and consequently, cotton damaged from ginning in the "heavily dried" state can be sold and bought for good cotton.

In a 1953 U.S.D.A. ginning circular it was stated: "There was a tendency for length and to some extent, fiber-length uniformity and tensil strength to become increasingly lower under more intense drying." A year later results of a ginning study by Leitgeb and Wakeham were published showing the degrees of damage to various fiber properties considered important to manufacturing performance. Compared with some of the same cotton ginned without heat at 6% moisture, cotton dried at 250° F to 3.8% moisture during ginning gave the following results: 1% decrease in the upper half mean length, 17% increase in the number of fibers shorter than 1/2 inch, 12% increase in fiber elongation, 2% decrease in water absorption, 6% decrease in skein strength of medium yarn, 2% increase in yarn nonuniformity, and 14% increase in the number of ends down in spinning. The same drying was accomplished at 450° F and many of the above types of fiber damage were shown to have been aggravated by drying at this very high temperature. A government publication made this year on work now in progress shows that cotton cleaned with overhead cleaners, ginned at between 2% and 3% moisture content and subsequently cleaned in a two-stage lint cleaner showed the following effects due to over drying in the gin: 13% decrease in visible foreign matter, 1.7% decrease in upper quartile fiber length, 21% increase in the number of fibers shorter than 1/2 inch, 8% decrease in yarn strength, and an increase in ends down in spinning of 8% for 30's yarn and 17% for 40's yarn.

Even though gins will run smoothly on extra dry cotton, in the very dry state the fiber is in poor condition for ginning. When moisture in cotton is reduced 1% the strength is lowered 6% and other fiber properties such as density, brittleness, and dielectric constant are also changed. Cotton manufacturers have always recognized this fact and have therefore always practiced some degree of moisture control. Cotton should receive as careful treatment in ginning as in manufacturing, and since it is now known that damage occurs from ginning cotton with either high moisture content or with low moisture content, moisture control must be practiced at the gin.

Research needs to be done not only in controlling the average moisture in seed cotton during ginning, but a study should be made of the moisture gradient throughout the length of the longer fibers on the seed as it reaches the gin stand. It is likely that the lint drying methods being used dries the exposed ends of the long fibers to a greater extent than the end attached to the seed. If this problem is found to exist, then perhaps a more penetrating type of heating such as "induction heating" should replace the hot-air convection method now being used.

Recent studies have revealed that over-drying in ginning is a greater hazard than over-heating. Tests have shown that cotton dried to 3% moisture content in ginning gave about the same yarn strength, fiber length, and yarn appearance whether the temperature in the drier was 300° F, 200° F, or 130° F. It has been shown, however, that gin drying at temperatures above 400° F can permanently effect such fiber characteristics as color, fluorescence, moisture regain, and modulus. It should be pointed out that high temperatures in the driers also increase the hazard of over-drying.

Some moisture removed in the gin drier can be restored before the cotton reaches the gin stand. One test showed that 1% moisture can be added to over-dried cotton between the seed cotton cleaners and the gin stand.

There is hope that some day cotton gins will be able to accurately control the moisture in the seed cotton they gin. But gins are not the only cause of some cotton giving poor spinning performance. Until high length variability has been largely eliminated from baled cotton the manufacturer will need a cheap rapid method for the determination of the length variability in cotton The present methods of fiber sorting are too slow and too costly to be applied to each bale, and an improved method must be devised.

In a study of spinning performance of cotton heavily dried in ginning, one manufacturer found that an additional cost of ten dollars per bale was incurred in processing such cotton. Through the years spinning tests made by the Department of Agriculture and others have consistently shown that a high variability of fiber length in cotton adversely affects yarn quality and spinning performance. A decrease of 5% in coefficient of length variability will add 1 lb. skein strength to 22's yarn, which is the same strength increase obtained by adding 1/32 inch to the upper quartile length. From recent work on spinning quality of cotton where accurate spinning end's down data was acquired it has become apparent that a high proportion of fiber thorter than 1/2 inch in cotton can be extremely detrimental to its spinning quality. A recent U.S.D.A. publication shows 86% of the variation in ends down in spinning 40's yarn was associated with variations in the proportion of fiber shorter than 1/2 inch.

There may be other bad aspects of over-drying cotton at the gin: There is, perhaps, increased fragmentation of immature seed and some other types of waste found in cotton. In some cases grade improvement due to gin cleaning does not add sufficient value to compensate for the loss of weight due to drying and cleaning. If not given time to condition prior to processing, extra dry cotton may upset mill production or receive further mechanical damage in manufacturing.

Cotton research faces two of its greatest challenges: the development of better moisture control in ginning, and the development of better instrumentation for the measurement of the short fiber content in a cotton sample. If these challenges are not met and dealt with successfully through adequate research, what are the other alternatives? Can manufacturers restore the spinibility to damaged cotton by combing?

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A Pneumatic Method of Measuring Cotton Fiber Staple Length

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ABSTRACT

A pneumatic device for measuring the Mean and Upper-Half Mean fiber lengths is described. Air is drawn through a cotton fiber beard (formed with two combs) placed over a narrow slit to form the fourth arm of a pneumatic Wheatstone bridge. It is shown that the unbalanced deflection of the "pneumatic galvanometer" across the bridge varies correctly with the number of fibers over it to enable measurement of the mean value from curves automatically drawn by the device.

For seventeen cottons data are presented, comparing the results of this method with those obtained with the Fibrograph.

INTRODUCTION

Since the pneumatic bridge developed for the Roving Evener (reported at the Cotton Research Clinic last year) would so easily measure the size of sliver or roving, it was thought the same bridge arrangement might be used to give the readings proportional to the number of fibers in a beard at any distance from the base. The beard is formed by the use of two combs as is done for the well known Fibrograph developed by Hertel. [1],[2]. Air is drawn through the beard through a thin 0.007" x 5.0" slit in the wall of a manifold placed at right angles to the fibers. Figure I shows a schematic diagram of the device. It is seen that the cotton and the slit form the fourth resistance in a pneumatic Wheatstone bridge. Corresponding to the galvanometer of the electrical bridge a differential bellows is used to measure the amount of unbalance caused by the cotton covering the slit and also move the pen, automatically recording the degree of unbalance on a chart as the cotton beard is drawn over the slit from base to tip.

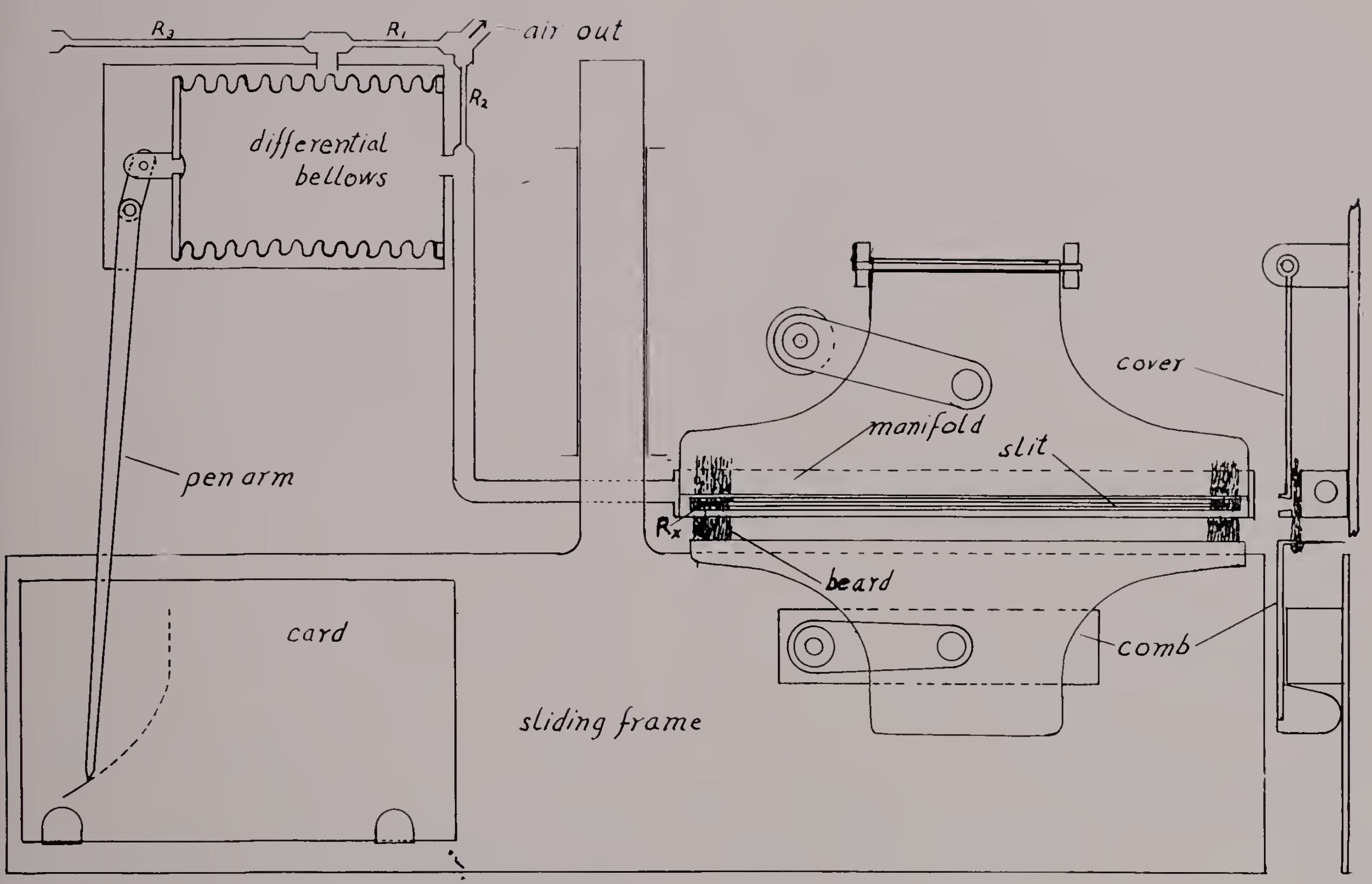
The bridge is operated unbalanced with a vacuum aproximately equivalent to a twelve inch head of water and for the thickest beard, the differential pressure across the bridge may approximate two inches of water. Of course, a higher vacuum would give greater sensitivity. The resistances R_1 and R_2 are usually less than half R_3 and Rx but are not critical, being made of one or two inches of tubing 0.11 inches inside diameter.

The eight inch pen arm is mounted on a shaft that is caused to rotate by the differential pressure across the bellows. The pen rests lightly on the card in a holder which is moved under the pen by the same sliding frame that carries the fiber comb.

By slowly moving the frame, the cotton beard is drawn past the slit and simultaneously the card is moved under the pen so that a curve is drawn. The Mean and Upper-Half Mean fiber lengths are measured by drawing tangents to the curve as is done with the Fibrograph. This procedure is valid if the distribution of fiber lengths in the beard is similar to that obtained by the sliver clamping method[3] in which the beard is made by clamping a sliver at a point and combing away the loose fibers on one side of the clamp.

DISCUSSION OF THE PROBLEM

For this pneumatic method to work, the deflection of the pen should be proportional to the number of fibers across the slit. Whether this is true, as would be expected, depends on several things that affect the galvanometer response to change in the resistance Rx and on the way the resistance of the slit changes with the number of fibers over it. For the Wheatstone bridge it can be shown that when Rx is two or more times greater than R_1 and R_2, the differential pressure across the bridge rises almost linearly with the increase in the resistance Rx. Assuming the resistance of the slit to be inversely proportional to its area, and that the galvanometer deflection is proportional to the increase in the slit resistance, the deflection caused by covering the slit should increase faster than the percentage of the slit covered.



Pneumatic Staple Length Meter

Figure 1

The theoretical increase in resistance caused by progressively covering the greater proportions of the slit (with tape), are shown in Figure 2. The deflections are plotted to a proper scale to make the two curves fit as closely as possible. It is seen that the agreement is good for covering approximately seventy per cent of the slit, which usually exceeds the working range in normal use of the instrument. The agreement of the curves shows that toal effective resistance of Rx is the slit itself, which is not much affected by the resistance of the connecting tube. Trying several sizes of tubing for this connector does not seem to change the shape of the curves given for various fiber beards.

From the above considerations it is noted the deflection is not linear with the percentage of slit actually sealed off and therefore if equal increments in the number of fibers over the slit effectively seal equal increments of the slit, the deflection can not be proportional to the number of fibers across the slit.

It would seem, then that the instrument would fail unless the effective sealing of the slit by fiber rises less rapidly than the number of the fibers. To show that this is the case, layers of 1 oz. fabric placed over the slit give deflections almost perfectly proportional to the number of layers up to eight.

The instrument can also be tested using fringes of fiber prepared by winding continuous filament fiber on boards, taping crosswise and cutting the fringes. placing successively equal fiber fringes over the slit again gives deflections proportional to the number of fibers across the slit proving that the sealing efficiency of fibers is less as more fibers are layed over the slit. Figure 3 shows the deflections given by layers of fabric or fiber.

If a fiber with a single staple length is used in the sliver clamping technique, the beard produced should have a linear increase in fibers per cross section from the tip to the base of the beard. Assuming that preparing the beards with combs gives the same fiber distribution, the instrument should draw a straight line for such beards. For some man-made fibers, the instrument gives practically straight lines.

By cutting fiber fringes in triangular shapes one can be sure of having a strictly linear increase in fibers from tip to base of the fringe. For such fringes made of nylon fiber the curves are practically straight lines. Figure 4 shows tracings of curves drawn by

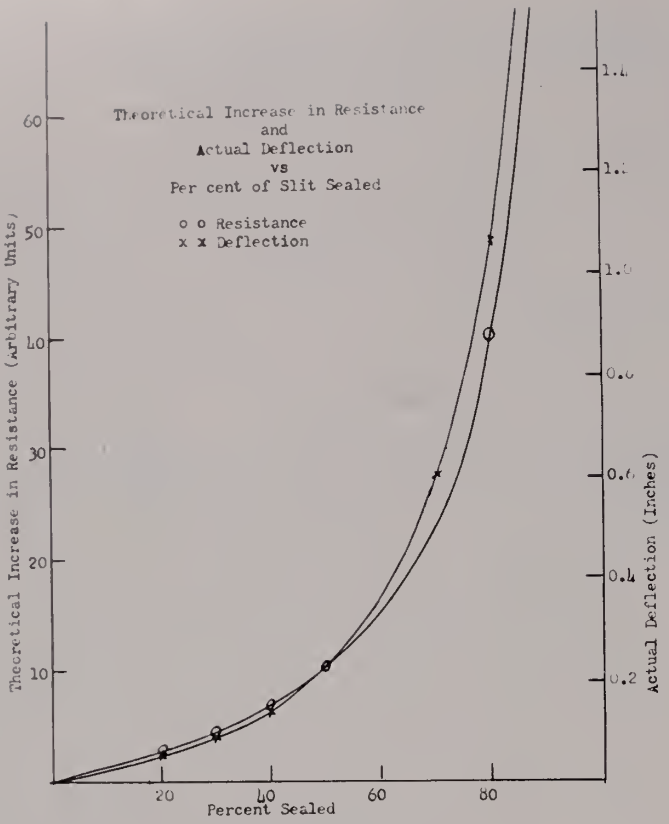


Figure 2

the instrument for Acrilan, Nylon, Viscose and Verel staple and for Nylon cut fringe.

The straightness of these lines and the fact that their slope is correct to give their staple lengths seems to prove that the device does indeed measure the number of fibers at each point along the beard and that for single staple lengths, preparing beards with combs gives the theoretically correct linear distribution of fiber ends in the beard. It seems surprising that the sealing efficiency for added fiber decreases at just the right rate to make the galvanometer deflection proportional, over a wide range, to the number of fibers across the slit.

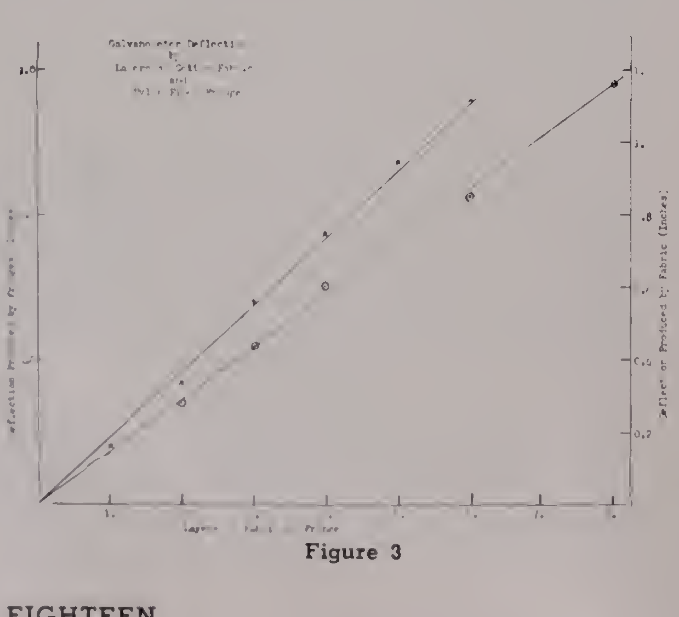


Figure 3

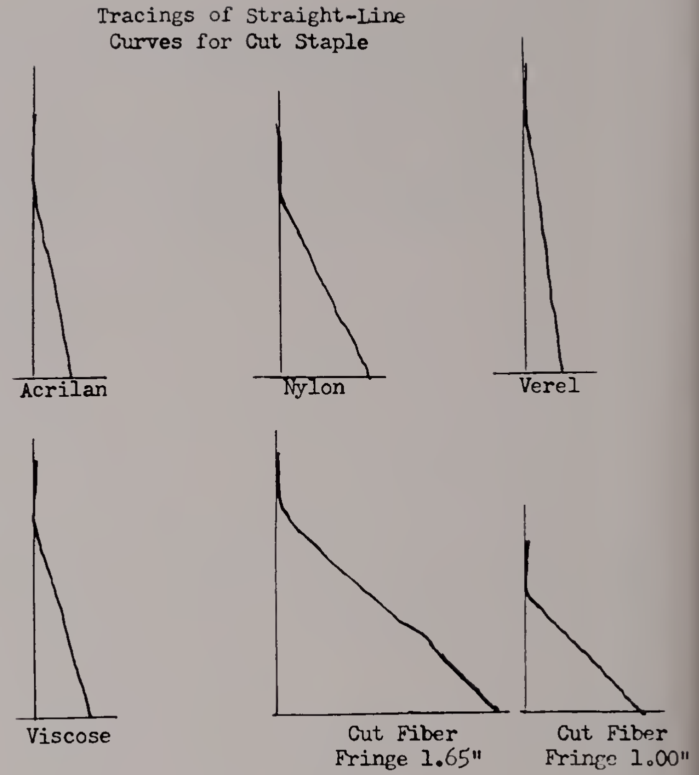


Figure 4

Some synthetic fibers, especially when using thick beards, gives curves convex upward. This must be due to the heavy crimp in the fiber which is straightened by the cover plate more effectively nearer the tip of the beard than at the base.

Triangular fringes of filament cut to different lengths can be overlapped to check whether the machine gives the correct mean length for known distributions. Using two triangular nylon fringes of the same number of fibers 1.70" and 1.00" the instrument draws a curve with one slope, until the shorter fiber has passed off the slit and with a higher slope from then on to the end of the longer fiber. A tangent to the initial slope gives, with fair accuracy, the mean length as 1.30" and a tangent to the final slope gives the length of the longer staple as 1.73" which is pretty fair agreement.

For the instrument to work for cotton it should give the correct mean lengths for a wide distribution of fiber lengths. The curves for cotton are always convex downward and seem to have the correct shape for the usual tangent lines to indicate both the Mean and Upper-Half Mean lengths. Seventeen cottons supplied by the U.S.D.A. and A.C.M.I. laboratories at Clemson were tested. These were check cottons for which the Fibrograph lengths were supplied. Table I gives the results of the pneumatic method compared with the given Fibrograph values. On each of the seventeen cottons six to nine readings were taken. (This first apparatus uses a single comb so

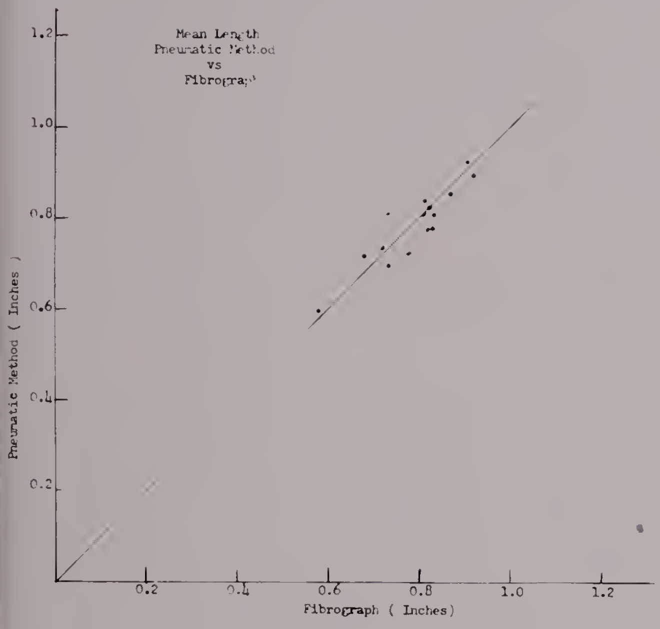


Figure 5

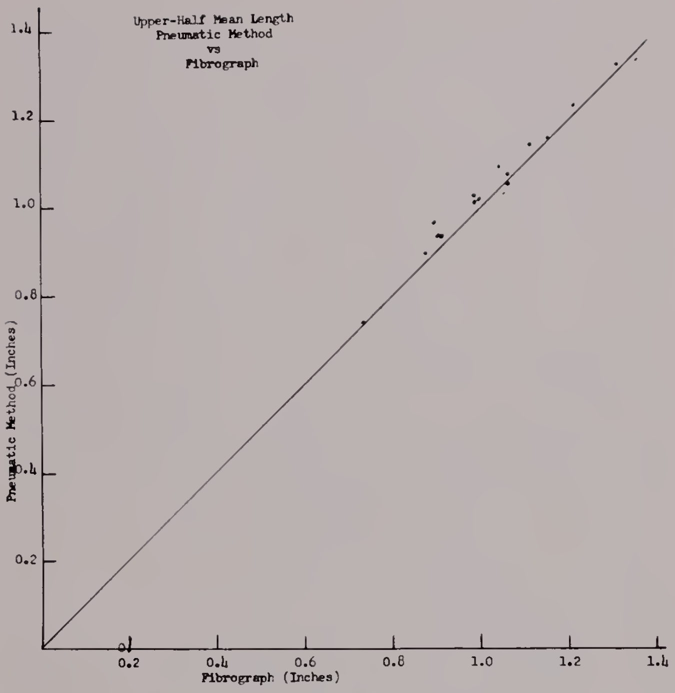


Figure 6

COMPARISON OF MEAN AND UPPER-HALF MEAN LENGTHS
BY FIBROGRAPH AND PNEUMATIC METHOD

MEAN LENGTH (inches)				UPPER-HALF MEAN LENGTH (inches)			
Length		Accuracy		Length		Accuracy	
Fibrograph	Pneumatic	Range	Standard Deviation	Fibrograph	Pneumatic	Range	Standard Deviation
.73	.74	.14	.04	.58	.60	.15	.02
.87	.90	.05	.07	.68	.72	.16	.05
.89	.97	.13	.07	.73	.81	.20	.06
.90	.94	.13	.03	.72	.73	.19	.06
.91	.94	.13	.04	.73	.71	.12	.04
.98	1.03	.09	.03	.82	.83	.06	.02
.99	1.02	.22	.05	.78	.72	.10	.04
1.00	1.02	.04	.02	.82	.77	.08	.03
1.04	1.10	.09	.03	.82	.82	.05	.02
1.05	1.04	.09	.03	.83	.77	.14	.04
1.06	1.06	.13	.05	.84	.80	.08	.03
1.06	1.09	.10	.04	.81	.80	.11	.04
1.11	1.15	.06	.02	.87	.85	.07	.02
1.15	1.16	.07	.03	.92	.89	.14	.05
1.21	1.24	.16	.06	.91	.92	.22	.10
1.31	1.32	.11	.03	1.01	1.01	.12	.05
1.36	1.33	.09	.03	1.04	.92	.14	.04

Table 1

the average for both combs is considered one reading for each sample.) Though it may be customary in routine testing to discard readings differing widely from the mean, in this case the values in the table include the results of every test taken on each cotton and for every cotton tested.

In Figures 5 and 6 are shown the values for mean and upper-half mean length plotted against the Fibrograph readings for each cotton. It should be realized that the deviations of individual results from the general trend can be due either to errors of the Fibrograph or of this method or of both. Incidentally, the consistency of the results may increase confidence in the reliability of the Fibrograph.

CONCLUSIONS

It is noted that the Mean Length values are slightly on the low side. Possibly part of the reason for this is that the air pressure in this work, not being perfectly controlled, falls from 0.25 to 0.5 of an inch in 12 inches as the beard is moved off the slit. Keeping the pressure constant should make the curve slightly less convex downward and therefore, give slightly higher values for the Mean Length but have relatively little effect on the Upper-Half Mean values.

The apparatus seems not to be very critical as to beard thickness. None of the samples were weighed and for half of the readings different beard thicknesses were purposely used.

The method does not require any certain air pressure but only that it remain constant during the individual tests. The pressure of the cover on the beard is not critical, though probably improved results might be obtained by having a better control of it.

Arranging a small motor to move the comb always at a constant rate may give better results than these obtained by moving the comb by hand. Possibly using the galvanometer balanced as a null instrument might improve the results. This can be done by using a second slit in the arm R_3 mounted at right angles to the slit for the cotton. A wedge type shutter over the second slit would be moved horizontally with the card while the pen would be lowered vertically with the cotton comb. There is a question whether the improvement would justify the additional cost and complication in operation .

Development of this instrument is still in progress but results to date seem to show promise for a pneumatic method of measuring staple length that would have the following advantages:

1. Requires no calibration or warm-up period.
2. Be free from drift.
3. Have no error due to off-color cotton.
4. Be easily checked at any time with synthetic fiber fringes of known length distribution. These could be furnished with each machine.

REFERENCES

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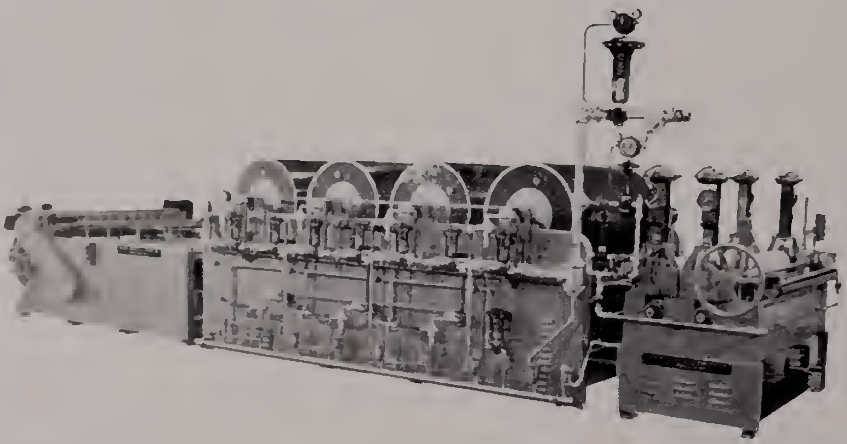
2. K. L. Hertel, TEXTILE RESEARCH, Vol. 10, 1940, P. 510.
3. K. Klinger, THE MELLIAND (English), Vol. 5, P. 692.

TEXTILES — THE FIELD IS UNLIMITED

(Continued from page 6)

Another question often arising among high school students is: "May I take graduate work at Georgia Tech or do I have to enroll in another school after graduation?" The A. French Textile School is equipped for graduate courses. Graduate courses may be scheduled in both options. Master of Science in Textile Engineering and Master of Science in Textiles are degrees offered. A graduate student works on his degree with such courses as Natural and Synthetic High Polymers, Advanced Yarn Manufacture and his Masters Thesis, naming but a few.

After four years of schooling the textile student is ready for the competitive industrial world. How is this graduate equipped and what are his opportunities? By the diversified program in his college years the graduating textile student has many choices and positions open to him. Actually, few industries today offer as many chances for success to young people as do the branches of the textile industry. Designers, salesmen, chemists, engineers, laboratory technicians, overseers, inspectors and specialists in machine operation and efficiency, personnel problems, testing, time studies, merchandising, and product development represent but a few of numerous trained technicians required by textile industries.



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Thus a textile engineer has many lanes opening to him upon graduation. His calling may be research where he works with the basics of textiles. He may perfect a machine that will be used by a fellow textile engineer in production work. He may decide that design is his field and draw up a new loom to be sold by still another engineer in sales. It is easily seen that the textile engineer, irregardless of his branch, is an invaluable aid to the textile industry and its progress.

A graduate in the Chemistry and Dyeing option is also faced with many oportunities upon completion of school. Commercial bleaching, dyeing or finishing plants are positions appealing to the majority of these graduates. But the synthetic yarn field and the manufacture or sale of textile specialties are becoming larger and larger outlets for these graduates. A great deal of the textile chemist's work in these commercial plants is research. Due to this experiment testing, orlon, nylon, dacron and numerous other synthetic fabrics are everyday words. They are being used in clothes and cloth products to an extent never before believed possible. Colors are more numerous and designs more varied. Handsome clothes, previously acceptable only handmade, are now being readied for sale in production quantities.

With his B.S. in Textiles, the manufacturing option student is ready to begin work in a mill. Actually he is ready to begin in the office of a mill. With his expert knowledge of textiles and the industry coupled with his training in office work insures for him an executive type job. He may begin as an overseer or foreman on the floor, but promotions are rapid. From these jobs the position of production manager is entirely feasible. Once his climb to the top has begun, the peak depends upon the capabilities and potentialities of the person himself.

There should be no doubt in anyone's mind that the textile industry is filled with opportunities and security for anyone interested in science or engineering. It is a growing field, branching in all directions. With a little interest and work, a future life of security can be had in the field of textiles.

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ITS YOUR FUTURE — CHOOSE IT WISELY

(Continued from page 7)

operation and textile chemistry. All of this work is related to the practical problems of management, marketing, costing, quality control and industrial relations. A knitting option is offered under this curriculum. A total of 150 credits are required for a textile manufacturing degree of which 65 are for textile subjects.

TEXTILE CHEMISTRY

Textile chemistry provides thorough training in the pure chemistries and in textile testing, microscopy, bleaching, printing, dyeing and finishing. Because of the close connection between production and research, the fundamentals of textile manufacturing are also taught. As a textile chemist you would be responsible for giving textile goods their sales appeal. This includes color, sheen, feel and many of the more dramatic properties introduced by modern finishing such as water repellency, crease resistance, permanent pleating and "wash and wear" features.

TEXTILE SCIENCE

Beginning this year Clemson is offering a new course in textiles called Textile Science. This new curriculum is the outgrowth of the changing textile field. This course is similar to the old Textile Engineering with the applied engineering subjects being replaced by basic courses. The amount of textile subjects will remain the same. The curriculum should be of particular interest to those students who plan to enter research or to further their education with graduate study. The basic sciences will include mathematics, physics and chemistry.

The Clemson textile faculty is a varied group composed of scholars, scientists and practical teachers. Most of them have had actual working experience in the textile industry and all of them visit textile plants at regular intervals so as to keep up with the latest developments. Many have done advanced study in their fields of specialization.

Sirrine Hall, which houses the School of Textiles, contains more than two and a half acres of floor space. Built in 1938, it was completely renovated recently and now contains the most modern textile machinery available, which is valued at more than a million dollars.

Textile education at Clemson has received great support from the textile industry itself. The J. E. Sirrine Textile Foundation now has more than one million dollars contributed by textile companies for use at Clemson. Some 250 manufacturers and machinery concerns have given equipment and special discounts on machinery to the school. You may benefit from one of the many scholarships and awards given by the textile industry.

Aerial view of the Clemson College School of Textiles

While studying textiles at Clemson you will be in the midst of varied research projects on all phases of this extensive field. In addition to the research work carried on by the faculty, there are many projects being carried out by two government and one industrial research laboratories located in the textile building. A new Research Center is to be located at Clemson.

There are numerous scholarships and loan funds at Clemson for worthy students in need of financial assistence. Subsistence and uniform allowance are paid to those students enrolled in the ROTC programs.

Several scholarships which are available for Freshmen entering the Textile School are:

Leon Lowenstein Foundation Scholarships — Two $2000 awards are available annually for male freshment who enroll in the School of Textiles, to be paid in equal installments during four years of satisfactory undergraduate study. Selection will be limited to applicants whose families have an income of $10,000 or less.

South Carolina Textile Manufacturers Association Scholarships—Two $2,000 awards, one from the J. P. Stevens & Co., Inc., and one from other association member companies are available for freshmen who enroll in the School of Textiles to be paid in equal installments during four years of satisfactory undergraduate study.

Texize Chemicals, Inc. Scholarship—A $2,000 award is available for a freshman enrolled in the School of Textiles to be paid in equal installments during four years of satisfactory undergraduate study.

Additional scholarships for undergraduate students include:

American Viscose Scholarship — A $500 award is available annually to a rising junior or senior majoring in Textile Chemistry or Textile Science.

Blackmon-Uhler Scholarship — A $1000 award is available annually to a rising junior majoring in Textile Chemistry, to be paid in equal installments during the last two years of satisfactory undergraduate study. Selection is based on need, ability and evidence of good character.

Burlington Industries Foundation Scholarship — A $1000 award is available annually to a rising junior majoring in Engineering or Textiles, to be paid in equal installments during the last two years of satisfactory undergraduate study. Selection is based on leadership, scholarship and financial need.

Ciba Scholarship—A $1000 award is available annually to a rising junior male student majoring in Textile Chemistry, to be paid in equal installments during the last two years of satisfactory undergraduate study. Selection is based on scholastic ability, financial need, personality and leadership.

Interchemical Foundation Scholarship — A $1000 award is available annually to a rising junior in Chemistry, Physics or Textile Chemistry, to be paid in equal installments during the last two years of satisfactory undergraduate study. Selection is based on scholastic ability, personal traits and financial need.

David Jennings ('02) Memorial Scholarship—Income from a fund donated by members of his family provides one or more awards for undergraduates, with preference for students majoring in Textiles.

Keever Starch Scholarship—A $400 award is available annually to a worthy rising sophomore majoring in Textiles.

Owens-Corning Fiberglas Scholarship — A $1200 award is available annually to a rising junior majoring in Engineering or Textiles, to be paid in equal installments during the last two years of satisfactory undergraduate study. Selection is based on scholastic ability, leadership qualities and financial resources.

Seydel-Woolley & Company Scholarship — A $250 award is available annually to a rising junior or senior male student majoring in Textile Chemistry or Textile Engineering. Selection is based on scholastic ability, evidence of leadership potential to the southern textile industry and financial need.

United States Rubber Foundation Scholarship — A $700 award is available annually to a rising junior planning a career in industry, to be paid in equal installments during the last two years of satisfactory undergraduate study. Selection is based on proven scholastic ability and financial need.

Your whole future and happiness may depend upon how and where you make your living. Before you make your final decision be sure that you are right. Consider all sides of the problem. What will the opportunity be, not only now but later, what are the chances open for advancement, under what conditions will you work, what security do you have, where will you be able to obtain employment, near home—in the South—or will you have to pull up roots and move to another part of the country?

Before making the final decision for your life's work, we would like for you to seriously consider a career in the textile field. Thsi industry ranks high in all industries.

Remember 80% of it is in the South and 30% in the State of South Carolina. The grass may be greener in your own back yard.

If you believe that your aptitudes and long-range interests lie in the field of textiles, we should like to discuss your future with you and to have you visit or get further information about textiles and Clemson from:

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or

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GREENVILLE, S. C.

The Waste Treatment of Sulphur Dyes In The Textile Industry

By
Russel Campbell, A&S '60

INTRODUCTION

This article shall attempt to correlate the scattered information on the waste treatment of sulphur dyes in the textile industry. These facts are both positive and negative in final results. This paper is limited to the sulphur dyes but will necessarily include combinations of dyes in some cases.

The main problem confronting the textile industry is a method of obtaining an economical and safe effluent. The process of treating the waste sulphur dyes must produce a non-toxic effluent, a disposable sludge, and a rapid and a cheap mechanical method.

Background. Although this paper is entitled "The Waste Treatment of Sulphur Dyes," some other waste problems must be enlarged upon to fully cover the subject. There is no standard waste treatment for the sulphur dyes. This is due to the differences in location and size of the plants, and types of preparations that the plants use in dyeing. However, in general the outline in this paper will be applicable to all plants.

What does the waste treatment of sulphur dyes entail? This is determined by the use of the effluent when finally discharged. State water commissions have rivers and streams divided into classes. An excellent classification by the Commonwealth of Pennsylvania follows.

Class A. Streams to be preserved in their natural condition. All artificial pollution of these streams is prohibited and wastes of their watersheds must be treated to a high degree of purity.

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Class B. Streams more or less polluted, but kept controlled to prevent detriment to public health, fish, and use for recreational purposes.

Class C. Streams so polluted that it would not be economical nor advisable to restore them but controlled so no public nuisance occurs.

What is an ideal effluent? To be an ideal effluent, after treatment it should be clear, colorless, odorless, neutral, and non-toxic. It should be free from all suspended matter and free from organic matter. The effluent should not contain any oils or any excessive mineral salts. No known method of purification will produce such an effluent.

There are many ways to treat sulphur dyes. The four main headings are sedimentation, equilization, chemical treatment, and biological treatment. A change in process may be necessary but is costly and avoided if possible.

Typical Process. To understand fully the treatment required, the process of the sulfur dyeing must be known. Sulfur dyes are a general group of direct dyes used only on vegetable fibers. They are used with the addition of sodium sulfide to the sulfur dyes of the dye bath. The exact nature of the sulfur dyes is unknown. It probably consists of organic derivatives containing sulfur as a constituent.

The principal colors of the sulfurs dyes are the blacks, yellows, browns, blues, and greens. They are especially fast to washing and acids in cross dying. They are soluble in an alkaline reducing medium. Sodium sulfide, sodium carbonate, and sodium cloride are used in the dye baths. Sulfur colors may be stripped by treating with chlorine bleach solution and acetic acid.

The Waste. The wastes from a sulfur dye process consists of four components. They are: dye liquor (saved), three rinses. The reason for saving the dye liquor is for economy. The spent dye liquor is made up to original strength and used over again. The sulfur dyes high concentration can be noted by this recovery plan.

Chemical Precipitation. Typical plant operations will be considered here. In many cases lab tests indicate good results but on plant scale these prove unworkable. A typical precipitation procedure will be outlined for a better understanding of some physical problems involved. Wastes from the dye house are taken to storage tanks. When a pre-calculated quantity of waste has been collected, it is mixed. Samples are checked by the laboratory. Then proper concentrations of chemicals are added. The waste is then mixed, flocculated, settled, and the effluent discanted. The sludge is placed on sand beds to dry.

The strong acids are the best precipitants of the sulfur dyes. Sulfuric acid will be considered first in this class of purifying. In typical operation sulfuric acid causes too much frothing. Hydrogen sulfide is evolved in large toxic quantities. Sulfuric acid causes sludge to balk and makes continuous operation impossible. Final sludge is good. It dewaters fast and forms a good cake. In a similar operation records were kept on sulfuric acid treatment of sulfur dye wastes. Thirty-three cubic centimeters of five-tenths normal sulfuric acid per one hundred cubic centimeters were used. The result was a fine precipitate which settled to one-third of the total volume in one-half hours. There was a strong evolution of hydrogen sulfide again. Also large quantities of collodial sulfur was present in the supernatant liquid. The supernatant liquid had a yellow tinge. The pH was lowered to 5.6, one and four-tenths off from neutral 7.0. This treatment required 72 pounds (32.6 Kgs) of 95 per cent sulfuric acid for 1.000 gallons (3785.4. 1) of waste. This is to high to be considered very economical. Several good results are shown in these figures. If the melodorous hydrogen sulfide difficulty could be overcome, the acid treatment might be useful.

Aluminum sulfate, or filter alum is a well known salt for use in chemical precipitation. However, with sulfur dyes, results similar to those of sulfuric acid were recorded. The sludge filtered good but too much hydrogen was liberated. In a particular case 18 cubic centimeters of 0.5N aluminum sulfate was used per 100 ccs of waste. Eighty-six pounds (39.0Kg) per one thousand gallons of waste was used.

Also tried in combinations were Aluminum sulfate and hydrochloric acid. Best results were obtained with 32 ccs of sulfuric acid and 3 ccs alum. This equaled 69 pounds of 95% sulfuric acid and 14.3 pounds of alum per 1,000 gallons of waste. Still settling was slow.

Ferric sulfate has been tried also. The ferric sulfate coagulates the waste without the hydrogen sulfide formation. Filtrability of the sludge was good, but settling was poor. Other iron salts such as ferric chloride and ferric chloride alum have been used in plants also. The ferric chloride gave a good precipitate with a clear supernatant liquid. The pH was 7.7 and the floc settled slow. There was no evolution of gas or free sulfur. Complete precipitation required 53 pounds (24.0 Kgs) of ferric chloride per 1,000 gallons of waste. The alum was added in an attempt to produce a larger floc. No better results were obtained however. Ferric chloride and hydrochloric acid were combined to improve the pH range. At pH below 7.8 clarification was not complete however.

Copperas and copperas-lime have been used in some plants also. The copperas produced a good precipitate but filtering of the sludge was not good. Effluent came through very highly colored. It appeared that mixing the waste in a flocculation chamber breaks up the floc. Without mixing, good filtering resulted. When lime-copperas was tried the results were favorable. There was a good floc and the sludge dried to a good cake overnight. It dewatered much better when applied in a layer 4.6 inches thick.

Chlorine has been used to treat sulfur dyes also. The results were unfavorable. Twenty-five pounds of chlorine per 1,000 gallons of waste were used. It produced a slow settling floc with a bulky sludge. A yellow color could not be removed. It has been considered uneconomical.

The use of chemical precipitants works very well with a proper coagulation agent. Good results can be obtained with proper control. The use of acid precipitates the pure dye and it can be re-used with excellent results. The dye from the sludge can not be removed when precipitated by other coagulants. Coagulants can be reclaimed in some cases and reused. If the hydrogen sulfide evolution could be checked, the acid treatment would have wide spread use.

The main objection to the use of chemical precipitants is the high cost. No waste plant can operate economically. Efforts to keep costs at a minimum must be used. The supervision of chemical precipitants have led to cheaper methods.

Activated Sludge. The activated sludge treatment on the sulfur dyes was attempted also. A typical activation process was used. From thirty-six gallons aeration tanks containing 500, 1500, 2500 and 3500 parts per million of solids in suspension were used. Aeration periods were for four, six, and nine hour intervals. Equal amounts of one-per cent dye waste per sewage mixture and air were used. Aeration for six hours but better than for four hours but little better for the nine hour period. Color removal was proportionate to sludge concentrations. BOD removed was affected little by the variations in air. Results over all were not too good. Chemical precipitation proved better than this method.

Trickling Filters. The waste problem has been given biochemical considerations too. The results have been favorable. S. E. Cobern reported in "Industrial Engineering Chemistry" that, "It is more economical to treat finishing plant wastes with a gage rate trickling filter plant than any other method."

The trickling filter term may not be generally familiar. The basic principal of the trickling filter is a slow movement of waste over biological slime which increases the stability of dissolved and divided solids. The trickling filter has the same purification principals of a natural stream. Oxygen, food supply and ascorbic organisms are necessary.

The trickling filter is an artificial bed of inert matter called a media, covered with naturally formed biological slime or zoological mass over which the mass trickles. It is not a filter in the sense that it removes solids. There is a divergence of opinion on the action that takes place. It is generally conceded that the gelatinous slime holds the solids for several days. The microorganisms "work over" the solids. The outer layer of the microorganisms are known to be aerobic and the inner layer is thought to be anaerobic.

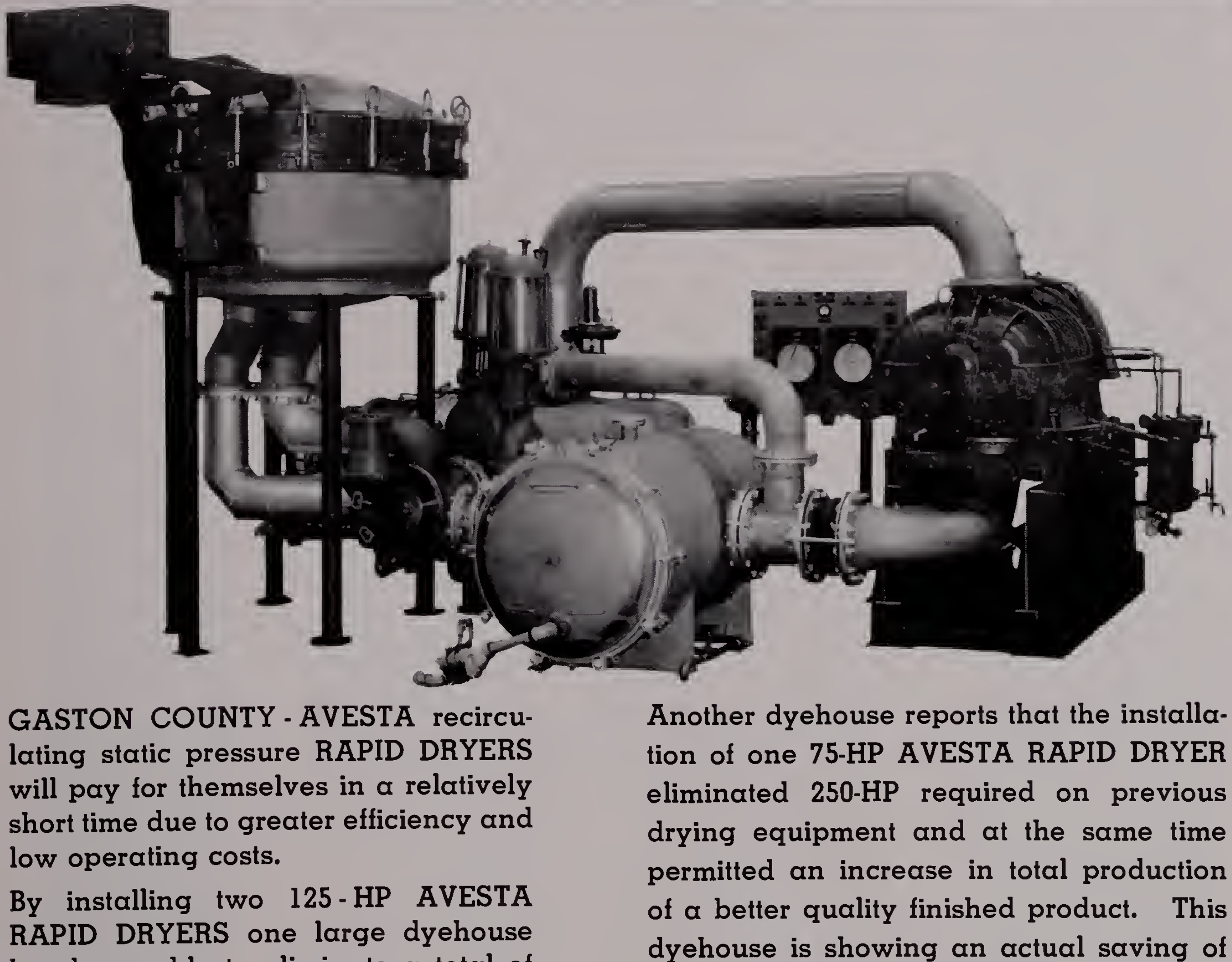
The trickling filter is the best biological treatment of mixed wastes. It is good due to its ability to maintain a constant degree of purification with varying wastes. The addition of a small quantity of nitrogen and phosphorous to the filter effluent makes the system more effective. This aids the biological growth.

As the term BOD has been mentioned, it should be defined. BOD is the biochemical oxygen demand that is the necessary amount of oxygen to oxidize matter in a stream under the influence of fact bacteria present. This is the common test for pollution of sanitary sciences.

The use of trickling filters is preferred due to the low cost of operation. The initial cost is high. It would be approximately $4500 more than the chemical system. The annual net charge would be $2500.

Summary. There are three methods for treating the sulfur dye wastes. They are chemical precipitation, activated sludge process, and the high rate trickling filters. In chemical precipitation the best results were obtained with the iron salts, ferric chloride and ferrous sulfate. This method proved to be costly over an extended period of testing. The activated sludge process was not practical nor were the results effective. This was discarded as useless. The high rate trickling filters produced excellent results. The initial cost was high but over a long period of testing the trickling filters proved to be the most economical process. Where possible, all periods of testing were for thirty-six months.

SELF LIQUIDATING



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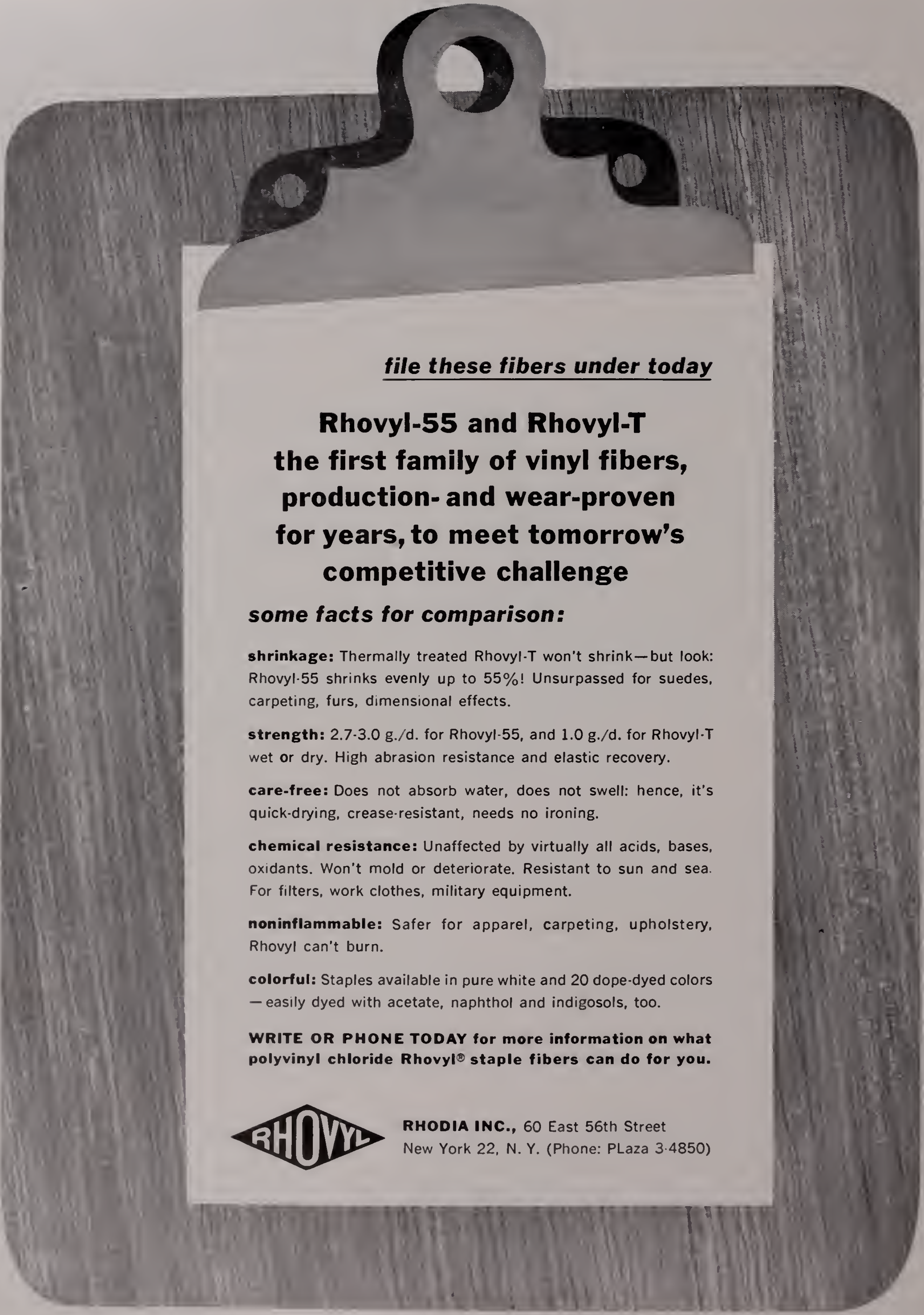

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From the Editor -

In making preparations for the Winter Issue, the staff thought it a good time to bring forth a picture of some of the newest developments made by the ever-increasing research program of the Textile Industry.

In reading our articles, the student, as well as those in industry, will find information on new and improved textile developments and on the research activities of some of the industry's leaders in the research and development field.

Throughout the magazine, the reader is made aware that research and development are becoming more and more important for livelihood in an industry having the fierce competition that is found in textiles.

The 1958-59 "Bobbin and Beaker" staff seated from left to right: Kenneth W. Powers, Business Manager; Joseph M. Fox, Advertising Manager; W. Wayne Freed, Editor; C. Lamar Green, Circulation Manager; J. Alan Bell, Managing Editor.

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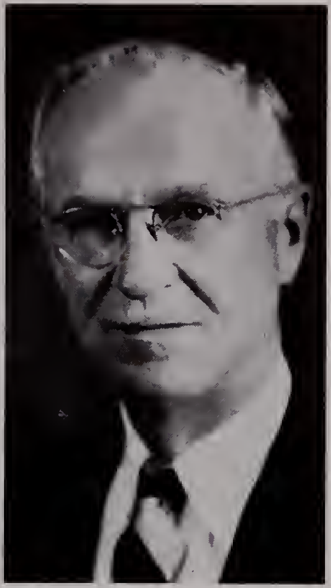
The Unifil Loom Winder

by

Jesse W. Stribling
Sales Manager, Universal Winding Company
Clemson, Textile Engineering '16



The Unifil* Loom Winder has brought further automation to the weave room. Replacing the conventional rotary battery on Draper cam, dobby and Jacquard looms—and requiring no additional floor space—it becomes an integral part of the loom. All the advantages of rewound filling are realized without the costs and floor space requirements for a separate automatic quilling department and without the necessity of battery plugging.

Filling yarns being successfully prepared on Unifil include single and plied cotton, spun and filament synthetics, blends of cotton and synthetics, and many types of novelty yarns. Wool and worsted filling yarns have not as yet been handled.

Unifil is not adaptable to box looms, although it is being used successfully on Draper filling-mix looms, where two shuttles are thrown alternately from two boxes on the lefthand side of the loom but are supplied with the same filling from the magazine on the right-hand side.

OPERATING SEQUENCE

The following outline may serve to explain the sequence of operations as Unifil prepares the filling for the loom:

1. The supply attachment is located at the rear of the loom and accommodates any conventional package, such as cones, tubes, pirns, cheeses, cakes, bobbins, etc. They are preferably transfer-tailed, to permit continuous operation of the winder.

2. Tension is mounted above the supply on a heavy iron plate suspended from four coil springs, to dampen loom vibration. A simple multiple-disc tension is standard for all yarns, which deliver overend from the supply package.

3. The sealed winding head is the heart of the Unifil system. It includes the winding spindle, traverse cam and builder mechanism that control quill formation, and the cycling mechanism that controls transfer of full quills to the magazine and feeding of empty quills to the winding spindle. All mechanisms operate in a sealed housing for adequate lubrication and for protection against oil seepage. The spindle winds the yarn fast enough to keep well ahead of loom consumption and to keep the magazine full of wound quills. Should the yarn break, there are sufficient full quills in the magazine to keep the loom running until the end can be retied; the faster yarn speed of the spindle then permits the magazine to fill up again to its capacity.

4. The full-quill magazine normally contains six full bobbins. When the bottom one transfers to the shuttle, another full quill drops down from the winder spindle. The yarn is cut automatically, and the end from the quill is positioned on a drum which holds it in a horizontal line in readiness for transfer to start winding another full quill.

5. The bunch builder, entirely mechanical and adjustable for length and width, automatically winds the bunch at the base of the quill, next to the butt. Wire cleats are used in the butt of the quill. When the quill starts to rotate, the yarn is caught by one of the cleats and winding of the bunch begins; the loose tail is wound under the bunch.

6. The clearer system automatically draws away and deposits in a waste can the loose ends of yarn from the quill transfer to the shuttle. It utilizes a vacuum created by a piston pump operated from the lay sword. Air from the pump is also used to keep the tension and other winder parts free from lint.

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*Reg. U. S. Pat. Office

7. The stripper is located just above the floor. On transfer, the ejected quill drops into the stripper, where the normal bunch is wound off automatically and the waste deposited in the waste can. If any yarn remains on the quill after the stripping operation, because of end breakage or early transfer of a partially-filled bobbin, the quill is automatically removed from the system and deposited in the reject tray under the conveyor. Only fully-stripped quills are dropped into the conveyor trough and retained in the system.

8. The conveyor system carries empty quills from the conveyor trough below the stripper back to the winder. A permanent magnet, attached to the endless conveyor belt, picks up the empty quill by contact with the steel rings and carries it to the empty-quill magazine. From this magazine, the quill starts its cycle again through the Unifil system.

SPARE WINDERS PREVENT DOWN TIME ON LOOM

In converting a weave room from conventional batteries to Unifil, it is customary to have on hand about three extra winder heads for each 100 looms to be used as spares and to prevent down time on the loom should the winder head have to be removed for major repairs. The winder can be changed in about two minutes. This type of work is done by a separate Unifil fixer. Minor repairs to the winder, those which do not require removal or which will take only a few minutes, are usually made by the loom fixer. In such cases the loom does not stop, since the full quills in the magazine will keep the shuttle supplied.

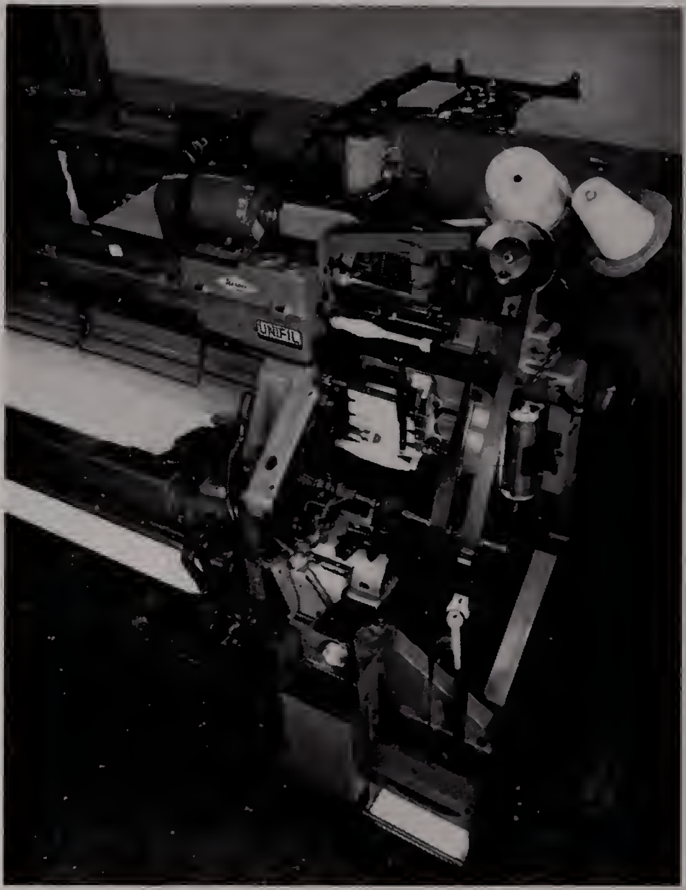
The Unifil system adds about one-quarter horsepower to the total power consumption of the loom, half of which is added to the loom motor for driving the clearer pump, attached to the lay sword, and for driving the stripper and conveyor, whose drive is taken from the cam shaft; however, there is almost always enough overload capacity in the loom motor to absorb this extra power.

The winder is driven by a separate 1/8-horsepower motor, same voltage as loom motor. A cable from the loom-motor junction box runs to the winder-motor switch box, into which the winder-motor cable is plugged.

One of the features of Unifil is the "sequential" winding and weaving of filling from the supply package, thus reducing filling bands. This is particularly true in weaving package-dyed spun filling and dope-dyed filament yarn.

Other features include:

1. Reduction of quill soilage; quills never leave the loom and are never mass handled.



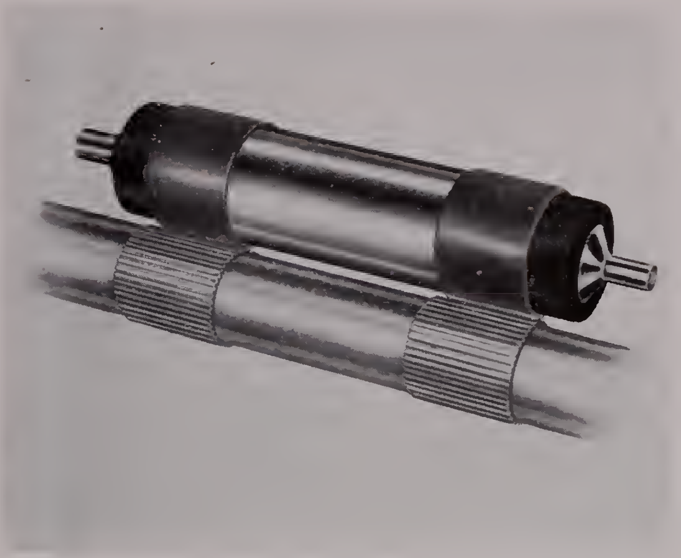
2. Reduction in quills required per loom, only twelve being needed for each loom.
3. Mixed filling practically eliminated; if wrong supply package is creeled, only one loom is affected.
4. Elimination of quilling area, quill hauling and storage, battery plugging, and stripping machines.
5. Simplicity of style changes; no large inventory of quilled yarn needed before change, no leftover inventory after change.

HISTORY OF UNIFIL LOOM WINDER

Unifil was conceived in 1947, when the decision was made to develop a system whereby the automatic quiller would become an operating part of the loom, not a machine in a separate department. It was first introduced to the industry as a laboratory model operating on a loom at the 1950 American Textile Machinery Association exhibition in Atlantic City.

Then followed several years of refinement, building of prototypes, thorough mill testing for several years on filament and spun yarns in three different mills, making of tools for manufacture of the finally approved design, and presentation to the textile industry in late 1956. Quantity production, using the assembly-line method, was begun in January 1957.

The New Model Gwaltney Spinning Frame



THE ULTIMATE IN HIGH SPEED SPINNING WITH NEW MAGNEDRAFT PRESSURE SYSTEM

Since its introduction in 1952, the Saco-Lowell Gwaltney Spinning Frame has been recognized throughout the textile industry as the only major successful revolutionary development in spinning in over a hundred years. Today, over 600,000 spindles of Gwaltney Spinning are in place or on order in 104 different mills, and the narrow frame equipped with balloon control rings is fast becoming the standard of the industry. Never before in the history of the textile industry has a new machine been accepted at such an accelerated rate. The Gwaltney has been the inspiration and has set the standards for new spinning frame design by textile machinery builders in this country and abroad.

Even though the Gwaltney frame has proven so successful, Saco-Lowell has continued to carry out an intensive research and design engineering program to improve the various components of the frame. The new model Gwaltney Spinning Frame is a major stride forward in attaining higher production rates. **It is available in four gauges, 3", 3½", 4", and 4½" with traverses up to 12", to provide mills the very maximum in pounds per square foot of floor space for particular yarns which they intend to run.** These gauges will accomodate ring sizes from 2" to 3½", making the improved spinning frame suitable for the complete range of yarn counts.

STREAMLINED

The scientific appraisal of operative effort has played an important part in completing the design of the new Gwaltney. Time studies and time and motion analyses were utilized to determine the optimum position of the components of the frame which are directly serviced by the doffers and spinners.

Toward this end, the working areas and subassemblies of the frame have been redesigned to speed up the motions of the operator. In its final form, the improved Gwaltney permits smoother, effortless operative motions without interruptions in continuity, as recommended by present time and motion standards.

MAGNEDRAFT

Foremost of the new assemblies is the new MagneDraft Pressure System for application to the improved Gwaltney. MagneDraft uses magnetic top rolls in the drafting element and does away with all the cumbersome auxiliary equipment for applying top roll pressures in conventional drafting systems. Magnetic force produces the required pressure where it is needed—between the upper and lower drafting rolls—instead of transmitting it through these rolls to the bearings of the roll stand and the frame itself. Since there is no longer any appreciable pressure on the bearings of either the top or bottom rolls, these can be made of materials which need no lubrication.

Placing the pressure where it belongs — between the drafting rolls—gives outstanding advantages. Total pressure required with MagneDraft does not need to be as great since much of the pressure required with conventional drafting elements is needed to overcome the friction produced by the usual weighting system. This, in turn, means less wear on cots and aprons and a reduction in the power consumed by the drafting element. The dimensional difference in the outside diameter between the cot covered section of the MagneDraft roll and the uncovered part of the roll is so small that the clearers constantly clean not only the cots but the surface area between and beyond the cots.

THE ELIMINATION OF LUBRICATION; THE EXCEEDINGLY FEW COMPONENT PARTS; AND THE MORE EFFICIENT CLEANING ACTION OF THE CLEARERS, MAKE ANY DRAFTING ELEMENT WITH MAGNEDRAFT THE CLEANEST EVER DEVELOPED. **All of these factors represent savings to the mill.**

LOWER FRAME

The new Gwaltney is 4 inches lower than previous models, making it easier to "creel in" and service the drafting element.

The over-all height of the frame was reduced by lowering the position of the roller beam 4 inches. At the same time the spindle rail has been maintained at the same convenient doffing height that characterized its predecessor. Time studies and practical mill experience have proven this to be the ideal level for doffing.

TILTING SEPARATORS

To further increase the efficiency of the doffing operation, we have installed improved Gwaltney tilting separators that may be tipped out of the way a section at a time by simply lifting one of the separators. These have proven to be particularly convenient on narrow gauge frames. Tilting separators speed up changing of travelers.

NEW BALLOON CONTROL RINGS

A new design of balloon control rings is an important feature of the frame. The bottom control rings are mounted on a sturdy bar to which also are fastened the individual ring holders, and thus they traverse with the spinning rings. The upper control rings and pigtails are mounted on a separate traversing mechanism, so that, at all points in the doff, control rings are placed in their most effective position. These controls rings present an entirely new contour to the yarn to provide for proper control under a wide variety of conditions.

NO RING RAIL

A significant contribution to the economic advantages of the improved Gwaltney is the radical modification of the new ring holding assembly. The conventional ring rail has been replaced with new, individual ring holders, which provide much less flat surface to collect lint and dirt. This innovation has greatly improved cleanliness in the area of the spindle, thereby reducing ends down, improving yarn quality, and facilitating cleaning.

HIGHER QUALITY, HIGHER SPEEDS

The new, improved Gwaltney is inherently a high-speed frame. **Depending on spinning conditions, this improved Gwaltney will give highest speeds for any given ring size and traverse.** The increase in speed and package size has been attained with an improvement in yarn quality. The tension on the yarn and the variation in the degree of tension throughout the doff are very low. This reduction in yarn tension enables the use of larger diameter rings or higher spindle speeds, which means that the traveler can be run much faster. More important, the tension is evenly maintained within close limits during the entire building of the bobbin and at all points of the traverse. It is this minimum variation in yarn tension that permits the use of the long traverse and larger rings required for maximum package sizes.

Travelers may be selected with much greater accuracy because of the uniformity of tension. This more precise selection is a major point in improving the quality of the yarn and the efficiency of the

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frame. The decrease in tension and concurrent reduction of yarn variation make it practical to increase traveler speeds substantially over conventional limits, as much as 60% in some cases. **With the improved Gwaltney, mills can use larger rings at higher traveler speeds without sacrificing quality or frame efficiency.**

The Gwaltney frame is able to spin yarns approaching the soft twist of mule spun yarns due to the reduction in tension. **Here is an unequaled opportunity to produce specialty fabrics which require a soft hand and ample cover.** Uniform twist is of equal importance whether the yarn is warp twist, filling twist, or soft knitting twist. In every instance, the uniform distribution of twist produces a better quality yarn.

SPEED-TEX RINGS

The economic advantages of the Gwaltney Spinning Frame, with its characteristically large package, are especially improved by the use of the Saco-Lowell Model 01C Speed-Tex Ring. THE SPEED-TEX FINISH REDUCES THE BREAKING-IN PERIOD FROM AS MANY AS 100 TRAVELER CHANGES TO AS FEW AS 5 OR 6. The 01C ring was designed specifically for the new Gwaltney frame because full utilization of its large ring diameters and long traverses has been limited by conventional ring design. This exclusive Saco-Lowell ring reaches a new high in large package spinning speeds. **Special flange contours permit traveler speeds never before atttained.** The inner flange, true bearing surface of the traveler, is full width to provide a wide, steady traveler path. The outer flange, not a true bearing surface, has been sharply reduced in width.

A wider traveler may be used without changing its total weight. A special wider traveler, developed by the Victor Ring Traveler Division of Saco-Lowell, is elliptical with a small circle resulting in a low center of gravity. The combination of low center of gravity and increased width result in better traveler balance, more stable operation, and superior running conditions. More bearing area and uniform pressure reduce traveler wear.

The Model 01C Speed-Tex has all of the advantages of other Speed-Tex rings — the shortest and most economical breaking-in period of any ring available. In addition to break-in advantages, it retains the high surface finish and long life of previous Pawtucket rings.

THE COMPLETE SPINNING CREEL

3-Way Adjustable Creel — New Sure-Lock Bobbin Holder

Standard on the improved Gwaltney Spinning Frame is a versatile combination—the 3-Way Umbrella Creel and new Sure-Lock Bobbin Holder.

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The new umbrella creel is adjustable in three directions. (1) The whole creel may be adjusted vertically on the creel posts. (2) The creel slats may be easily adjusted in relation to each other. (3) The individual bobbin holders may be adjusted longitudinally on the creel slats. Careful attention has been given to the contouring of the extruded aluminum creel slats and the covering of all joints and connections so that the creel itself not only presents lint-free surfaces, but offers minimum interference with the air from the overhead blowers which are intended to keep the roving clean. The Saco-Lowell creel may be obtained either with roving guides for double roving or roving rods for single roving. Formed steel creel girts provide a rigid, yet light support for the creel slats. The mounting brackets are die castings.

The adjustable creel is equipped with Saco-Lowell Sure-Lock Bobbin Holders for easy, trouble-free roving bobbin support. A ball bearing mounting provides for easy turning of the bobbin holder and roving bobbin to insure against stretched roving. The bobbin is secured to the holder by a positive latch, actuated by the simple on and off movement of the bobbin. The entire latch is made with a minimum of moving parts and no lubrication is required for either latch or bearing. In addition, the bearing is so constructed that any lint accidentally blown into it will work its way out again. To prevent the possibility of roving over-running when the frame is stopped, a brake of exactly the right weight is provided for the roving bobbin. This brake, which presents no sharp edges to the roving, is provided with a large curl on the end that assures that it will not interfere with the creeling of a roving bobbin of any size.

NEW ERA SPINDLES

New Era Spindles are standard on the new Gwaltney frame. It is a mill-proven fact that the New Era Spindle accrues savings in power, oil, and maintenance. The ball bearings need be lubricated only every four to five years or at intervals of 24,000 to 30,000 hours. The quality of yarn produced from Gwaltney frames equipped with New Era Spindles is definitely improved due to the more uniform speed and absence of vibration.

INTERCHANGEABLE GEARS

All of the change and constant gears in the head end and in the draft gearing are of the same bore and have teeth of the same pitch and width. This special feature, standard on all Gwaltney frames, means that one set of gears can be used as change gears for draft, twist, and lay, with the only difference in any gear being the number of teeth. The interchangeability eliminates the necessity of carrying a large stock of gears. The gearing is designed so that changes in draft gear constants may be quickly made.

HEAD END

The standard Gwaltney reversible twist assembly enables mills to shift from Z to S twist very quickly. In order to change the twist from Z to S, or the opposite, the head end gearing has a twist gear swing arm. This assembly allows the twist gear to be meshed with either the right-hand or left-hand rotation of the spindles.

BUILDER MOTION

The Gwaltney type builder motion is sensitive and accurate and produces well-formed bobbins carrying a maximum package. It is adaptable to warp, filling, or combination wind. The new builder develops uniform motion for the ring holders, balloon control rings, and thread guides. A wide range of change gears gives complete control over the rate of traverse and the taper at both ends of the bobbin, as dictated by the yarn being produced. While the builder motion is adaptable to warp, combination, or filling wind, we have made such recent strides in cam design that filling wind with its better operation and savings in waste can be used in a large majority of situations.

A VERSATILE FRAME

The new model Gwaltney, like its predecessor, can be equipped to meet the spinning requirements of a vast range of mill organizations. It is indeed a versatile spinning frame since the different types of drafting assemblies for the Gwaltney readily adapts it to the entire range of staple lengths of both cotton and synthetic fibers either in virgin stock or blends. Each of the five different drafting assemblies is designed to cover a specific range of staple length. Basically, two mill-proven Long Draft Systems are used, the Shaw and the Duo-Roth, both available with MagneDraft Pressure System.

PROFIT-MAKING ADVANTAGES

There are four basic reasons why the new improved Gwaltney is the frame of the future and the best profit-making spinning frame ever designed.

1. The yarn is of better quality, stronger, and more even.

2. Production and efficiency rates give unequaled economic advantages.

3. Larger packages assure a more efficient winding operation.

4. Maintenance expenses are exceptionally low.

Research at American Viscose

The activities of the Research and Development Division of American Viscose Corporation are centered in suburban Philadelphia at historic Marcus Hook on the Delaware River. Here, in a spacious five-story building is located a research staff of nearly 500 scientists, engineers, technicians, and clerical workers. They perform basic research in the chemistry of polymers, both natural and synthetic. They also endeavor to find solutions for the myriad problems encountered in preparing new products for commercial production and in improving present products and processes.

A separate research department for the Corporation was first established in 1922. The department grew steadily and moved into larger quarters in 1940. In 1954 a major reorganization and expansion of research facilities was begun and has now reached fruition. Research and Development has recently become a full-fledged Corporation division, headed by vice-president Herschel H. Cudd. The division consists of four departments devoted to the functions of basic research, development, technical service and administration.

BASIC RESEARCH

Long range and fundamental research intended to yield background information which will lead to entirely new lines of business and to provide a better understanding of the chemical and physical phenomena upon which present products are based is carried out here. Organic chemists synthesize new polymers and their intermediates. These polymers are evaluated for their fiber-and film-forming abilities on a laboratory scale. High pressure equipment and techniques are often utilized in the preparation of intermediates and in polymerizations. Others are studying factors which influence the behavior of thermoplastic molding compounds and another group is studying the physical chemistry of polymers.

The physical chemistry of cellulose, cellulose xanthate, and related compounds are also investigated. The fundamentals of viscose preparation, aging, coagulation, and the regeneration of cellulose are being examined. In addition, studies of the effect of molecular structure upon fiber properties and of the mechanism of filament formation are under way.

The laws and methods of physics find application and help to provide a better insight into the behavior of polymers and other materials. Experts study the mechanical and thermo-dynamic properties of polymers, the use of x-rays to elucidate their structure, and the morphology and rheology of polymers.

The Radiochemistry Laboratory is equipped to use radioactive tracer techniques as an aid in solving chemical and physical probelms.

DEVELOPMENT

Improvement of current products and processes, and evaluation, development and pilot production of new products are carried out in the Development Department by chemists, chemical and mechanical engineers, mathematicians, physicists and other technically trained personnel.

Improved processes for production of cellulose-acetate fibers are under investigation as are the reactions and behavior of cellulose esters, ethers and their derivatives. Other fields of interest include evaluation of textile chemicals and development of dry, wet, and melt spinning processes for a variety of synthetic fibers.

Some people are primarily concerned with the development of stronger and better fibers derived from viscose. "Viscose" is a viscous, unstable dispersion of cellulose xanthate in dilute sodium hydroxide. When this dispersion is extruded into an acid bath through minute holes it forms continuous filaments of regenerated cellulose—rayon—while extrusion through a narrow slit produces a continuous band of cellophane. Rayon is used in wearing apparel, home furnishings, and a number of industrial products. Improvements are continually being sought in the preparation of viscose, in the initial spinning of the fiber, and in its subsequent processing and finishing. Better processes for producing colored fibers by adding pigment or dye to the spinning dope before extrusion are also studied.

Some scientists work with relatively short fibers of regenerated cellulose comparable in length to the natural fibers of cotton, silk, and wool. The short fibers are spun by our customers into yarn. They are also used in nonwoven fabrics and as absorbents and filtering media. Rayon staple has recently found a large volume market in tufted carpeting. We are endeavoring to produce staple fibers with increased strength and resistance to crushing and soiling for this and other markets.

Improvement of manufacturing processes for producing cellophane and of coatings to modify its properties for specific uses are investigated in film research. During its manufacture cellophane can be dyed, made flame resistant, or treated with anchoring agents which improve the adhesion of coating materials. For certain end uses it is necessary to apply moisture-proofing and heat-sealing coatings to facilitate automatic machine packaging of many products. Other coatings help to retard spoilage and color change in meat products and other goods. Development of tailor-made packaging materials of these types has helped to make possible the modern self-service supermarket.

Engineers design and operate the pilot plants of the Research and Development Division. Here the processes and products developed in the laboratories are scaled up and evaluated on a semi-production basis, and design data for possible commercial production are obtained. The facilities include a machine shop equipped to make, service, and repair a large variety of experimental equipment.

TECHNICAL SERVICES

Analytical chemists carry out standard chemical analyses and also devise new analytical procedures needed for the development of new products and processes.

Other problem-solving techniques that are available to all research and development personnel include optical and electron microscopy, infrared spectroscopy, x-ray diffraction, and light scattering. Personnel in the electronics laboratory provide help on new instrumentation for both research and control work, and a data processing laboratory staffed by mathematicians is equipped with a Bendix digital computer.

Testing and evaluation of samples of fibers, films and other new products are carried out, too. New or modified test methods are developed to suit changing needs.

A technical information service provides literature searches, translations and reference service. Information selected from the current journal and patent literature and from internal laboratory reports is made available via an abstract bulletin. Nearly 300 technical and scientific journals are also available for distribution.

RESEARCH POLICY

The basic policy of the management of the Research and Development Division is to staff the laboratories with top-quality research men and to give them as much freedom as possible to work creatively. The best available equipment, instruments and literature resources are supplied. Production facilities are made available when potentially profitable new products are developed. Publication of scientific papers by research personnel is encouraged and attendance at, and participation in, professional meetings is considered beneficial to both employee and Corporation. Financial aid to employees who are furthering their careers by college evening studies is provided.

ACHIEVEMENTS

Scientists at the American Viscose Laboratories have published for many years many outstanding contributions to the chemistry of cellulose and the theory of cellulose fiber structure. Recent publications have been in general areas of organic, physical and analytical chemistry, and physics as well.

Products and processes developed recently include a rayon "super-super" tire yarn of great strength, a rayon staple called "XL Staple" that has outstanding wet strength, and Avicron, a filament possessing a latent crimp which is developed only after contact with water. This product has great potential value for pile fabrics. Processes for the production of metal filaments, which may lead to improved filter media and sintered metal products, and of fibrous rubber, which can be formed into mats to be used as a rug underlay material, have also been evolved recently.

Outstanding Seniors - - -

by
Tommy Ariail

David Allen Powers, is a Textile Manufacturing senior from Lamar, S. C. Allen is now serving as President of N.T.M.S. He was a member of the Pershing Rifles, and is now a member of Phi Psi, Student Assembly, and on the Council of Club Presidents.

Allen has shown his abilities and leadership qualities not only in organizations on campus, but he has been the holder of four different scholarships while at Clemson. These scholarships were: The Camp Loan Fund, Carolina Yarn Association Scholarship, Chemstrand Scholarship, and the Civitan Scholarship. He has also helped on his expenses by working in the dining hall as a waiter and by being a Hall counselor this year.

Dong Wha Kim, is a Textile Engineering Senior from Seoul, Korea. He is one of the most active foreign students at Clemson College.

Dong has served as Treasurer of Phi Eta Sigma; treasurer of the National Textile Manufacturing Society; secretary-treasurer of the Presbyterian Student Association, and he was a member of the "Tiger" Jr. Staff his junior year. At present, he is serving as vice-president of Foreign Student Association. Along with these many duties he is also a member of Phi Psi; Phi Kappa Phi, and the YMCA Cabinet. Dong was recently elected to Who's Who in American Colleges and Universities.

The Keever Starch Scholarship has helped Dong with his school expense.

Harold Kenneth Lingerfelt, better known around school as Ken is a Textile Manufacturing major from Morristown, Tenn. At present, he and his wife are making their home here in Clemson.

Ken received honors his first year at Clemson, and high honors first semester of his sophomore year. He was a member of the 1957 baseball team, and he is a member of the Veteran's club; SAM, and is vice-president of Phi Psi.

Ken served three years in the army of which two were served in Germany. He has gained valuable experience by working for American Enka Corporation in Lowland, Tenn., for the last four years.

The G. I. Bill has helped Ken with his school expenses.

A Single Thread Slasher

By

John Graham
Textile Research Department, School of Textiles
Clemson, S. C.

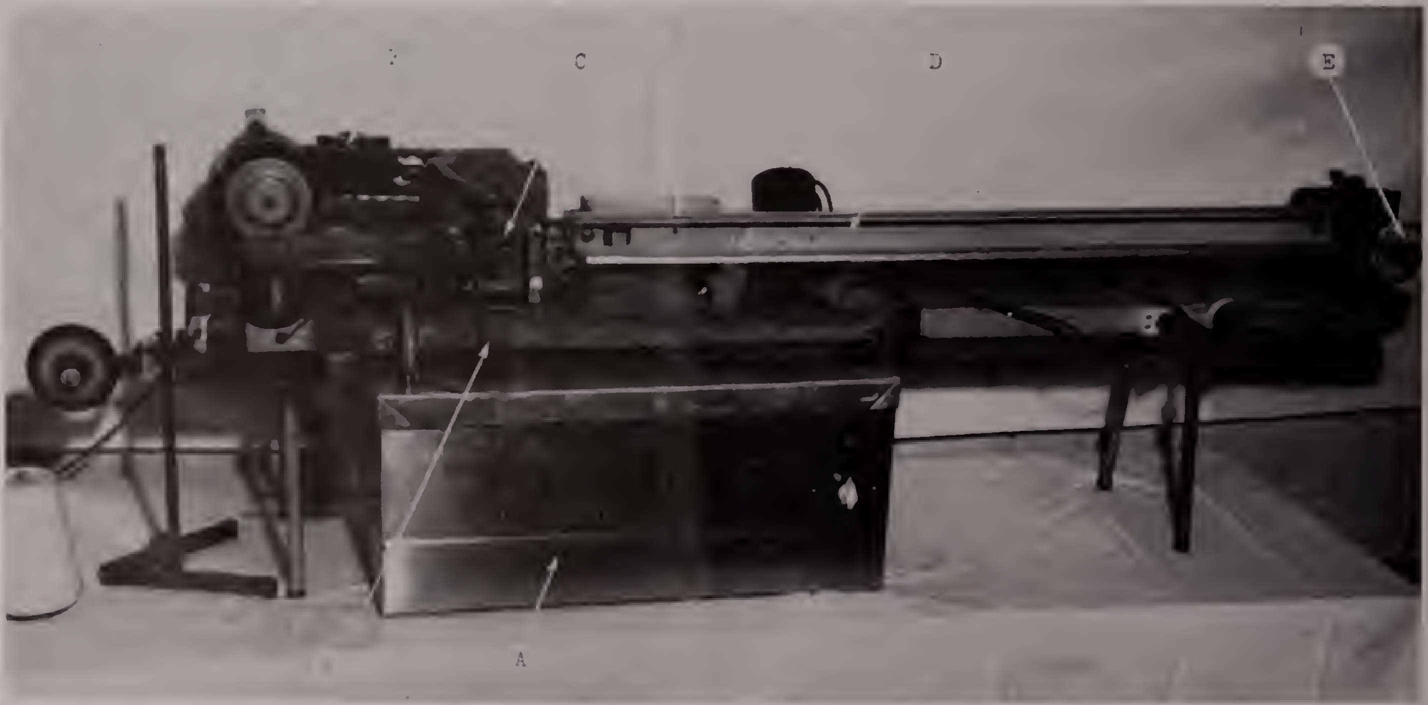
In textile chemical research at Clemson College several research projects involving the treatment of textile yarns have required the application of great numbers of chemical preparations to yarn. Frequently only a small amount of treated yarn is needed to determine whether a certain preparation shows sufficient promise to warrant extensive testing. For such preliminary experimental work it is essential to have a rapid method of treating lengths of yarn of 100 yards or less.

It is desirable to have the yarn emersed into the test solution at constant temperature, subsequently squeezed between rolls at a fixed pressure; then rapidly dried to a constant moisture content, the yarn being under constant tension throughout all these processes. To attempt all this by hand methods would be very tedious and time consuming and would, of course, be subject to human error. Therefore, the single thread slasher shown in the photograph was constructed by the Clemson Textile Research Department. Some of the construction details are as follows:

A. **Temperature Control of Test Solution:** Beneath the Slasher squeeze rolls a beaker containing the test solution is partially emersed into a conventional laboratory constant-temperature bath which rests on a table below the platform of the slasher.

B. **Emersion:** A simple porcelain yarn guide on a stainless plunger can be depressed or raised to emerse the yarn or to remove it from the beaker.

C. **Extraction:** A pair of 1 in. rubber squeeze rolls remove the excess solution and advance the yarn at a constant rate which can be adjusted from 3 yd./min. to 6 yd./min. by means of a variable-speed drive. The amount of moisture remaining after passage through the hot air dryer is adjusted by adjusting the speed of the yarn.



D. **Hot Air Drying:** The single strand of yarn passes 5 times longitudinally through a 3½ ft. insulated duct through which is blown heated air. A damper over the fan intake regulates the temperature within the dryer. Beyond both extremities of the dryer small aluminum pulleys with ball bearings carry the loops of yarn passing through the dryer.

E. **Tension Control:** For tension control the incoming yarn is drawn over a G. E. magnetic tensioning device. The take-up tension is also controlled by a G. E. magnetic tensioning device, but in order to wind the yarn the magnet of the G. E. device is rotated by a small gear motor and the yarn is wound on a rim formed from heavy gage aluminum foil. The aluminum rim is made to fit snugly over the periphery of the plastic yarn-furnishing disc of the G. E. tensioning device.

F. **Yarn Length Control:** A high-speed revolution counter with automatic switch is provided for controlling the length of the specimen. Since it is easy to make all foil rims the same weight and since they are moisture proof, oven drying and weighing can be readily accomplished without unwinding the yarn from the rim.

This miniature slasher has only been used to run lengths of yarn less than 100 yds. to the package, and no attempt has been made to exactly control the moisture content of the treated sample. It has proven very satisfactory in performing the job for which it was designed and it can be easily altered to meet other requirements.

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New Whitin Spinning Frame Promises Higher Quality and Productivity -- Lower Costs

PIEDMONT MACHINE INCORPORATES MODERN DESIGN CONCEPTS AND MANY TECHNOLOGICAL ADVANCES IN SPINNING

A streamlined new textile spinning frame combining many recent technological advances with Raymond Loewy styling has been unveiled by the Whitin Machine Works, Whitinsville, Mass. It was shown to the public for the first time at the Greenville show, October 6-10.

Called the Piedmont, in a salute to the area of the southeastern United States, the new frame is styled to achieve an exceptional combination of form and function. Operational efficiency, performance and productivity of the machine will be attractive to manufacturing executives whose specific goals are based on costs; its pleasing appearance will instill pride in those who work with it.

NEW FEATURES

Piedmont features include: 27" over-all width, covered individual spindle drive, side drive shafts, straight line of spinning, traverses up to 12", scientific balloon control ring application. All gearing and a new builder unit are enclosed in head end. Pneumatic waste removal unit and a new arrangement to disperse motor heat are integrated in the basic design. Unitrol top arm weighting and the latest type of Whitin SuperDraft two-apron drafting systems are employed. Either 3½ or 4-inch gauge with appropriate ring size are available, machines can be made with up to 312 spindles in 3½-inch gauge or 264 spindles in 4-inch gauge. The Piedmont is available in spindle increments of 24.

PROVED PERFORMANCE

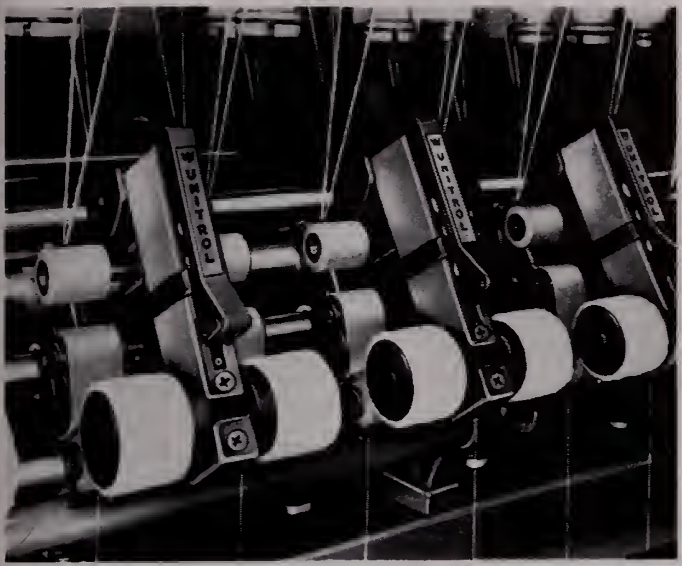
Five years in development, the Piedmont has been thoroughly tested both in the Whitin Research department under simulated mill conditions and in mills in the broad range of production spinning embracing all counts. Based on the company's 115-year experience in building spinning frames known throughout the industry for productivity, quality performance and profit making capacity, the new frame has more than met its designer's objectives. Comparable performance characteristics can be expected with the innumerable synthetics and blends.

BASIC DESIGN

A growing industry's need for a frame occupying less floor space was recognized and engineers adopted 27-inch width as optimum. Rather than mechanically and physically compresing the frame into this reduced width, or comprising by partial design modification, Whitin completely redesigned the frame. Piedmont results in a markedly different frame embracing several important operating and mechanical advantages. Chief among these are: reduced floor space, elimination of the cylinder, tapes, underframe pulleys and cross shafts; better and higher yarn quality; decreased operating, production and maintenance costs. Of special importance is the sharp reduction of air currents in, under and beside the machine as well as the improved control of relative humidity in drafting and spinning zones.

FRAME CONSTRUCTION

Particular attention has been given to securing constructive rigidity and capacity for absorption of vibration. Head end is an assembled cast iron unit, side rails and samsons are also cast iron. Ring rails and roller beams are steel. For added rigidity, single piece roll stands extend across the frame connecting both sides. Running the length of the frame, two spindle drive shafts are mounted close to the spindle rail.



NARROW WIDTH

The 27-inch over-all width of the Piedmont realizes 25-35 per cent saving in floor space over standard 39-inch frames which are 42 inches over the bumper rails. Maximum exploitation of floor space can be realized where mill conditions permit. Many present mills with 24, 25 or 26 foot bays are restricted in the number of frames that can be accommodated. The favorable small space requirement of the Piedmont will result in more spindles in a given area with avoidance of "wind tunneling" when other physical factors relevant to spinning permit.

SINGLE SPINDLE DRIVE

An entirely new drive mechanism is employed on the Piedmont frame. Each spindle is driven by a small, strong, endless belt. With 180° contact whorl, this belt drive provides uniform spindle speeds and uniform twists generation. The entire driving unit and idler pulleys are mounted on sealed-for-life antifriction ball bearings. Speed ratio of spindle drive shaft to spindle is 2.50:1. Starting, stopping or operation of any one spindle in no way affects the operation of any other spindle.

Less than ten seconds is required to replace a driving belt whether machine is stopped or running. The new single spindle drive eliminates cylinder, tapes tape tension pulleys. Air turbulence created by large packages, high spindle speeds, long traverses and the conventional cylinder drive border on the critical. By eliminating a large share of the air turbelance, advantages of the single spindle drive are apparent in higher speed operation.

STRAIGHT LINE SPINNING

Straight spinning is as old as the spinner's art; it was used in hand spinning and the spinning wheel. A return to this straight path has been given serious study in recent years. However, today's conditions involve factors not previously considered critical, such as larger roving packages, more precise drafting systems and speeds of a much higher order. Consequently, successful application of straight line spinning at high speeds with large packages is closely related to satisfactory balloon control. Principal advantage of a straight line from front rolls to the spindle is that twist can run unimpeded from traveler to the bite of the front rolls. Even distribution of the twist gives increased yarn strength. According to the evidence, the largest percentage of breaks occurs at the emergence of the yarn from the front rolls.

Straight line of spinning, higher uniform spindle speeds attained by the single spindle drive, improved twist distribution and scientific balloon control combine to give the Piedmont higher production of more even yarns.

BALLOON CONTROL

Balloon control becomes critical as package sizes increase above 9" and as speed increases. More than 25 variables are involved in scientific balloon control such as ring diameter, spindle speed, count and yarn diameter, angle of yarn pull, air drag, traveler weight and many more.

Piedmont's balloon control arrangement employs two control rings slightly larger than the spinning ring. Moving simultaneously and over the same distance, the rings act to separate the balloon into several smaller balloons. Maintaining the same relationship through the traverse, optimum balloon control is realized.

Prior to doffing, all balloon control rings are raised and folded back out of the way, an important factor in reducing time. Five seconds or less is required to wind up the control rings and thread guides and very little effort is required because of the mechanical advantage and nicety of balance.

Reduction of yarn tension makes its greatest contribution to betterment of the spinning condition by reducing the number of ends down. Experience to date on the Piedmont indicates that this improvement is marked and significant. More uniform yarn tension, longer distance for twist distribution and fewer ends down all contribute to more even, stronger yarn. Mill operation tests have indicated that yarns spun on the Whitin Piedmont at higher spindle speeds are more even and have higher break factors than yarns made in regular production in the same mill with the same roving. Cost benefits include better quality finished yarn and fabrics, fewer seconds, and reduced costs in subsequent operations.

SPINDLES AND BRAKE

Whitin's Pioneer spindle is the latest antifriction type equipped with a new positive-action hand brake. Brake lever is conveniently located on top of the spindle drive housing; it acts in a squeezing motion applying equal pressure to both sides of spindle. One of the most important elements in the spinning frame, Whitin Pioneer spindles are recognized as being remarkably strong and stable in running performance at high speeds and have the lowest maintenance, lubrication and operational costs.

NEW HEAD END WITH NEW GEARING ARRANGEMENT AND BUILDER

Main drive gearing, draft gearing, complete builder and traverse mechanisms are all contained within the sleek, streamlined new head end. All gears used are casehardened steel, precisely cut and with same bore, face and pitch to permit interchangeability of draft, twist and lay gears. Eight bearings require relubrication at six-month intervals, all other head end bearings are sealed-for-life ball bearings. All gears are easy of access, safety-lock doors open wide and automatically shut the machine off when open. Three ranges of draft are obtainable by changing two gears. Total draft range is 5-75.

For any one of three draft constants (1.33, 2.0 or 4.0) the number of teeth in the single draft gear equals the draft desired multiplied by the constant used. Draft change gear calculation thus is greatly simplified. A broad range of lay selection is available for flexibility and accuracy.

NEW BUILDER

Piedmont's new builder design provides another interesting and significant improvement. Cam action is transmitted into precisely controlled motions for the ring rails and balloon control rings. Some of its distinguishing features are: simplified adjustments and operation, accessibility for changing winds, easy and exact pick selection.

The cam action is transmitted to a horizontal shaft through the new builder motion. Directly connected to this shaft, ring rail chains and counterbalance springs provides positively uniform raising and lowering motions. Thoroughly tested over a long period of time, the Piedmont's builder provides a new de-

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gree of precise ring rail motion so important to good bobbin tapers, formation, wind, yarn lay and high-speed wind off. Warp, filling or combination cams can be used.

Utilization of this ring rail motion reduces traveler wear, rate of yarn tension change and promotes fewer ends down. Bobbin building functions are such that smooth wind-off is secured with the most desirable spinning conditions.

TRAVERSE

Guided by large, lint-free concave guide rolls, ring rail chains effect a steady motion of the ring rails. Compensating cams and heavy spring counterbalancing combine to provide uniformity of movement with no binding or "jumping" during the cycle.

WHITIN SUPER-DRAFT AND UNITROL

Whitin's modern drafting system has been used on frames employing more than 12,000,000 spindles. Adopted in the United States in 1929 by Whitin, the original Casablancas two-apron drafting system has been improved and modified. Whitin's Super-Draft provides accurate control of the fibers, flexibility in handling fiber lengths and excellent all around performance on the full range of drafts and on all counts.

Bottom rolls are casehardened and screw jointed, carefully manufactured to close tolerances. Since non-lubricated top rolls are used in the middle and back, no lubrication is required except for several-year-cycle lubrication of the front top rolls. Introduction of oil, and attendant yarn spoilage, is eliminated from the drafting area.

Whitin's latest type Unitrol top arm weighting is used. A single line of revolving clearers is used, leaving the remained of the drafting area open to the cleaning action of the overhead cleaners.

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WASTE AND MOTOR HEAT REMOVAL

Integrated into the basic frame design, waste removal units and broken end collectors operate to maintain cleanliness while occupying the minimum amount of space. Clean air from the waste removal system in the foot end passes over the motor, entirely enclosed in the foot end, and is then blown upwards or directionally as desired. This Pneumakool system, developed by the Pneumafil Company, precludes heat formations near the end of the frame and its attendant reduction of humidity in that area.

CREEL

A new umbrella creel has been designed for the Piedmont providing most desirable bobbin placement and permits better cleaning. Casablancas bobbin holders are employed. A two-post creel support increases rigidity of the unit.

Features of the new Whitin Piedmont aggregate contributions to higher speeds, greater production, improved yarn quality, fewer ends down, reduced space use and decreased operating, maintenance and production costs. The open construction provides complete freedom from clutter inviting maximum use of air cleaning.

Whitin's Piedmont, because of its new design and features, broadens the horizons of the textile industry to new areas in quality and productivity with productive costs below those now known.

DEPARTMENT OF COMMERCE SEES BETTER YEAR FOR TEXTILES

The Department of Commerce has forecast some improvement next year in the cotton broad woven fabrics and woolen and worsted manufacturing industries and a substantial upturn in the man-made fiber broad woven fabrics industry.

The department made the forecast in a review of the industries' position in 1958 and their outlook for 1959.

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AGILON -- STRETCH YARN

Excepts from Deering Milliken Service Corporation booklet, 'Agilon". Reprinted by permission of Deering Milliken Service Corporation.

Agilon stretch nylon yarn is a continuous filament nylon yarn to which torque-free elastic properties have been imparted by physical modification attained through a novel mechanical process. Available in both singles and plies, it offers a wide range of "hand" varying from one of soft silkiness to any desirable degree of firm or crisp texture . In polyfilament yarns, it combines the softness of spun yarns with the smoothness of continuous filament yarns, while in monofilament yarns it presents a unique but pleasing, resilience. These and other attributes combine to give the lower deniers of this yarn particular usefulness in women's hosiery.

WHAT IT WILL DO IN WOMEN'S STOCKINGS

Stockings knit with **Agilon** yarn in both boot and welt provide excellent two-stretch which allows gentle, comfortable hugging to the contours of the wearer's legs without wrinkling, even under the most vigorous of body movements. The 15-denier monofilament hosiery combines the sheerness of conventional stockings with exceptional comfort, freedom from binding, beautiful satin-like appearance and improved wear-life. When knit with 40-denier **Agilon** yarn in the welt, the 15-denier 3 filament yarn produces a beautiful stocking with all the strentch attributes plus a soft silkiness previously unattainable in nylon hosiery. Although 30 and 40-denier hose are normally sold as service weight, such hosiery of **Agilon** yarn is surprisingly sheer. In wear tests, 30-denier hose have been worn every day for 2 months without appreciable damage. All **Agilon** yarns may be knit without difficulty on single feed machines; while multiple carriers may be used, they are not necessary, because **Agilon** strentch yarn offers the unique advantage of a singles yarn without twist which is relatively dead at the time of knitting, but develops a high degree of elasticity when scoured properly. With a moderate amount of care, these yarns may be readily knit on standard machines. Dyeability is similar to that of regular yarn.

Perhaps the most important question to the hosiery manufacturer today is, "What makes a stocking fit?" The answer to that question is its ability to retain its shape from morning until night and its ability to contract from stretched conditions.

In an effort to provide quantitative evidence of stretching and contracting characteristics, five types of hose were subjected to an ATM standard scissors test (designation No. D1058-51) at the welt and boot, each area being stretched under a ten-pound load, the load released and the immediate contraction measured.

The hose tested were all made of 15-denier monofilament yarn except for those made from **Agilon** 15-denier 3 filament yarn .

Of the five types of hose tested, stocking made of **Agilon** yarn have the greatest ability to stretch from and to contract to their original size. Because their original size is smaller, due to the elastic properties engineered into the yarn, the hose hugs the foot and leg and fits comfortably. To corroborate further, actual photographs have been taken demonstrating the excellent correlation between stretch, contraction and proper fit.

1. CONSTRUCTIONS

Excellent results have been obtained on both circular and fully-fashioned machinery, using the following constructions:

Fully-Fashioned

	Ultra Sheer	**Sheer**
Boot	15-d., 1 f. or 3 f.	20-d., 7 f.
Welt	30-d., 10 f., or 40-d., 13 f.	40-d., 13 f.
Splice	30-d., 10 f.	30-d., 10 f., or 40-d., 13 f.

Circular

Boot	15-d., 1 f. or 3 f.	20-d., 7 f.
Welt	30-d., 10 f., or 40-d., 13 f.	40-d., 13 f.
Heel & toe	30-d., 10 f., or 40-d., 13 f.	40-d., 13 f.

In addition, beautiful service-weight stockings have been knit with 30 or 40-denier yarn in the boot and 40-denier yarn in the other parts. Two ply, 30-denier **Agilon** yarn is excellent for seaming fully-fashioned hosiery.

Any experimental yarns made by the nylon yarn producers can normally be purchased in experimental quantities as **Agilon** yarn. It is recommended that on 300 and 340 needle knitting machines yarn less than 20-denier shoud not be used, for 370 and 400 needle machines the denier should not be less than 15, and for 474 needle machines 12-denier is recommended.

For looping and seaming 2/30 denier **Agilon** yarn is recommended. The yarn used on 45 gauge fully-fashioned machines should not be less than 20-denier, on 51 and 54 gauge machines not less than 15-denier, and on 60 and 66 gauge machines not less than 12-denier.

GREIGE MILL PROCEDURES

General Principles To Be Observed

The machine should be threaded up in such a way as to avoid turning the yarn through any guide by an angle of more than 60°, devices which nip the yarn so as to back up twist should be eliminated, and the dancing weight type of tensioner should not be used on 15-denier yarn. Cut guides and fingers must be eliminated and it is recommended that they be made of Heanium, Alsimag or Syntox.

Yarn Tensions

Yarn tension should be about one gram at the finger on seamless machines and about five grams where it enters the carrier on fashioned machines.

Caps and Guides

If good control of humidity is maintained, it is possible to knit seamless and fully-fashioned stockings using a simple cap fitted to the top of the package of yarn. These caps are obtainable from Plastic Built, Inc., P. O. Box 905, Greenville, South Carolina.

If it is not possible to maintain a humidity of at least 60 per cent in the knitting room, a more positive type of yarn control is necessary for fashioned knitting.

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This equipment can also be obtained from Plastic Built, Inc. Guide Surfaces should preferably be made from Heanium, Alsimag or Syntox.

Humidity

The humidity is preferably controlled between 50 and 65 per cent. It should be measured daily with a sling psychrometer near the yarn on the knitting machine and the result compared with the reading shown by the humidity control instrument. In many mills the two readings will be quite different, and the controller should be readjusted to give the required humidity at the knitting machines.

Handling of Yarn

Yarn should always be handled by holding the end of the package. On no account should the fingers be allowed to come in contact with the yarn. Otherwise, the ends of yarn will be rolled on each other, and the package will deliver badly. The yarn should preferably be stored in an area in which the humidity is controlled to that of the knitting room for at least 48 hours before knitting from it. The package should be treated as a delicate and expensive material.

Handling of Stockings

To avoid snags stockings must be handled with great care. All rough surfaces should be covered with soft, smooth material. Those handling the stockings should be subjected to a daily inspection of hands or obliged to wear suitable gloves. All the equipment should be inspected for rough places, and if found, these should be polished with crocus cloth.

KNITTING ON SEAMLESS MACHINES

(1) Knitting in Mills with Controlled Humidity

Good results in knitting require free delivery of yarn at an even tension. This obtained by a properly designed cap on the supply package. The inside of the cap is turned down to a 3° 51' taper to fit the cone. These caps are available from Plastic Built, Inc., Box 905, Greenville, South Carolina. In most cases the yarn supplier will furnish a sufficient number of caps with the first shipment of yarn. The use of a tensiometer to check the tension in the yarn is good practice, leading to economies in production by early detection of cut guides and errors in setting up the yarn on the machine.

On the circular knitting machine, the yarn must be taken by the straightest possible course and through the minimum number of guides to the needles, avoiding sharp changes in direction on passing through the guides. After the yarn leaves the knitting cap surface it passes through a guide centered above the supply package, then to a satin finished guide and finally through the open porcelain gate tension device. The The first guide centered above the package can be used as a tensioner by raising or lowering; however, optimum conditions are 8½ inches above the plastic cap when the relative humidity is 55%. Many knitters use stainless steelguide eyes and porcelain eyes on their knitting machines. In the interest of good quality and economical operation, these guides should be replaced with Alsimag, Heanium or Syntox whenever 15-denier nylon yarn is being knit, as the yarn rapidly cuts the softer guides and all control of tension is lost.

FINISHING

The finishing procedure is, of course, very important. The greige fabric must be scoured before any other heat treatment, and then it may be dyed and boarded (as in the Drum System), or it may be boarded (high temp.) and then dyed and final boarded.

1) Seaming Fully-Fashioned Stockings

A neat elastic seam may be obtained by using **Agilon** 2/30 thread in both hooks and a No. 6 plain seaming thread in the needle. All three threads should be tensioned in the spring pressure disks, and the ratio control not used. The seaming machine should be adjusted to make twelve stitches per inch, checked by seaming the folded edge of a paper at full speed. The No. 6 thread in the needle should be tensioned to produce a small seam. In seaming, the stocking should be held at a tautness, similar to that used for seaming plain nylon hosiery, except for seaming the top. As **Agilon** fabric contracts much more than other yarns in processing, the welt fabric should be fed to the seaming machine with as little tension as possible.

GREENWOOD
MILLS

The seam in the finished stocking will be straight if made as prescribed, and processed by the Dunn System and on DMRC boarding forms. Proper seaming, scouring and boarding are importing factors.

Scouring

Since the elasticity of the hose is developed during the wet finishing, scouring must be done **before** preboarding or steaming. A rotary or wash wheel-type machine is recommended. There are two scouring cycles, one for stockings made from 15-denier monofilament yarn and the other for stockings made from 15-denier 3 filament yarn. The cycles are not interchangeable. Whatever denier of stocking is being scoured, it is recommended that each bag contain one dozen pairs, the bag being tied as near to the opening as possible, leaving plenty of room for the stockings to move around inside. The machine should be loaded with a 1/2 to 2/3 normal load measured in dozens of pairs of stockings.

Preboarding

All boarding forms used should be narrow and short so as to take full advantage of the elasticity in the fabric. The shape of these boarding forms was especially designed to give the finished stocking a neat fabric appearance in the ankle and foot and a toe that is more free of wrinkles. The conventional time/temperature cycle is satisfactory, keeping in mind that less severe heat treatment is usually given dyed stockings. When the Dunn system is used, the steam should be rather dry to avoid water marks in the welt and the cycle recommended is 1 to 1 1/2 minutes steam at 250°F., followed by 1 to 1 1/2 minutes dry. The foot length should be one-half to one inch shorter than the smallest size for intended use. The length of the stocking is adjusted on the form, pulling the fabric down to give 22 1/2 inches from the bottom of the foot to the top of the welt for a small or (A) size stocking, 24 inches for a medium or (B) size stocking, 25 1/2 inches for a larger or (C) size stocking and 27 inches for tall. It is important that the stocking be pulled onto the form gently and smoothed out to give a fabric having a uniform density.

As the dimensions and shape of the boarding forms have an important bearing on the finished appearance of stocking of **Agilon** yarn, we have designed special patterns for the A. B and C proportions which are coordinated with stocking construction. They were carefully designed to reduce wrinkles at the toe and heel, and contoured to provide a neat fabric throughout the foot, ankle, knee and welt. The adoption of these forms will simplify the operation of boarding to length standards. Furthermore, the **average courses per inch in boarding the length** of the foot and leg fabric are approximately the same in all foot sizes and length proportions. This is further assurance of maintaining maximum elasticity and recoverability in the finished stocking. However, stockings made of **Agilon** yarn will cling snugly, without binding, to every contour of the foot and leg, even when they are not made exactly to these standards. But, when made to these standards, the stockings will fit comfortably both the smaller and the larger foot size, as listed for each category.

The A, B and C boarding forms are coordinated with DMRC stocking construction and boarding standards. The average courses per inch in boarding the length of the foot and leg fabric are approximately the same in all foot sizes and length proportions. The adoption of these forms will simplify the operation of boarding to length standards which will further assure maximum elasticity and recoverability in the finished product. However, stockings made of **Agilon** stretch yarn will cling softly to every contour of the foot and leg, even when they are not made exactly to these standards. But, when made to the standards the stockings will fit comfortably all the foot sizes, as listed for each category.

ATTRIBUTES

In the Stocking

Below is a summary of attributes which have been found in women's seamless and fully-fashioned stockings constructed of **Agilon** stretch nylon yarn.

Comfortable feel on legs:
  Yield gently to every movement without binding.
  Conform to every curvature.

Excellent two-way stretch:
  Trim fit without wrinkling, even on very slender ankles.
  Good fitting welt over a very wide range of thigh sizes.
  Excellent elasticity at knee, without wrinkling, for life of stocking.

Excellent shape retention in service:
  No growth after repeated wear.

Good counter appearance:
  Uniform, unique, crepe-like appearance.
  No wrinkling along seams.
  Uniform dyeing.

Good sheerness:
  Even the 30 and 40-denier service-weight hose are surprisingly sheer.
  Very attractive, dull, smooth appearance.

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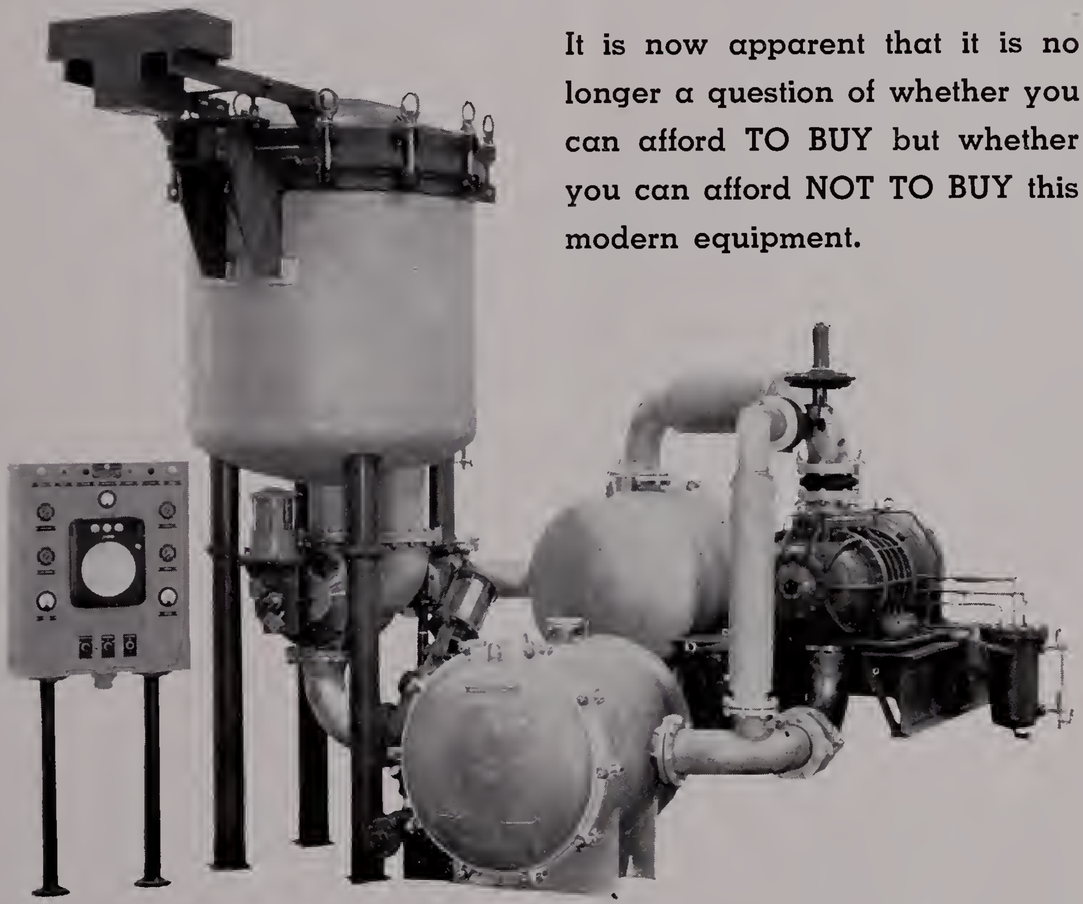

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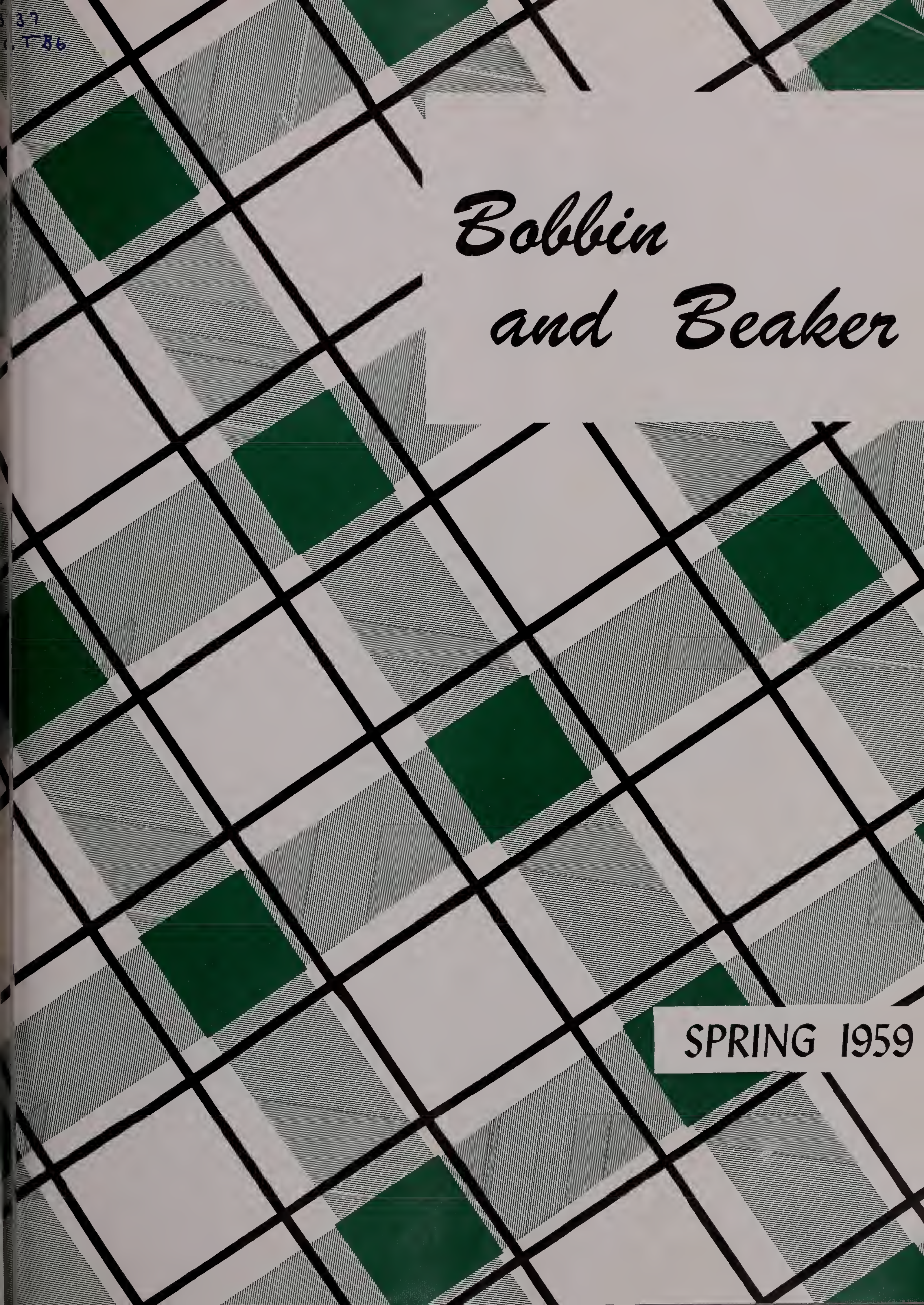

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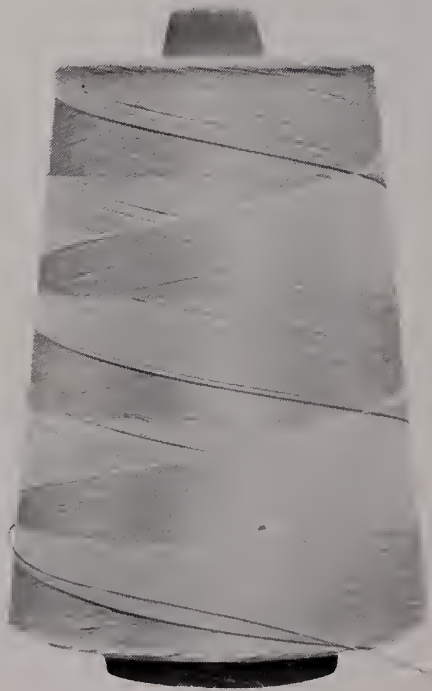

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From The Editor . . .

News! This is the theme. Throughout the Spring Issue are items of interest to those here at Clemson and to those in industry. This news is of the past, present, and future.

In glancing over the contents, you will find that it contains articles about the activities and products of two of the industries prominent members. Thoughts on management and engineering are well presented in our pages. There is also a tribute to "a man among men" in the textile industry. These, and other articles, are rounded off by a series of short news items on event happening at the Clemson Textile School.

And so passes another staff! It has been our pleasure serving you over the past year, and it is our sincerest hope that you have enjoyed "the fruits of our labor." —Wayne Freed, Editor

The 1958-59 "Bobbin and Beaker" staff seated from left to right: Kenneth W. Powers, Business Manager; Joseph M. Fox, Advertising Manager; W. Wayne Freed, Editor; C. Lamar Green, Circulation Manager; J. Alan Bell, Managing Editor.

American Enka

By

Wilson Ayers
Editor, Enka Voice

America Enka Corporation, one of the nation's largest producers of man-made fibers, is this year observing its 30th anniversary.

Establishment of the rayon plant of American Enka at Enka (near Asheville), North Carolina in 1928 was the "prime forerunner" of industrial chemical production in North Carolina.

It was on July 1, 1929 that the Dutch-founded concern "spun-in" what has remained a continuous output of viscose rayon. From an original capitalization of 16 million dollars, the Company's growth during three decades has resulted in a current investment of approximately 120 million dollars.

Enka now ranks as the country's second largest producer of rayon; and is also a major producer of the new "Tyrex" tire yarn, and a substantial manufacturer of nylon. The Company has plants at Enka and Lowland, Tenn., employing 5200 persons. The annual payroll is in excess of 22 million dollars.

The Company moves into 1959 with confidence in its future. After several years of depressed business, the textile industry has been in an improved position in recent months. During the year ahead, over-all demand for textiles should be up about eight per cent, according to McGraw-Hill's Department of Economics.

Tyrex tire cord is now in short supply and is expected to be in strong demand during 1959. Last year, Enka produced more than 20 per cent of all viscose tire yarn used in this country. Sales of tire cord have amounted to more than 50 per cent of Enka's total business for several years. Auto manufacturers use Tyrex cord tires as standard equipment on 99 per cent of all new models.

The auto industry, also the biggest industrial consumer of textiles, will probably buy larger quantities of Tyrex cord tires and textile rayon and nylon if the predicted increase in auto production materializes.

During the years that American Enka has been making tire yarn, it has maintained a research program to develop stronger and stronger fiber. Its efforts have been highly successful. In the period from 1950 to 1957 viscose tire cord was greatly increased in strength and flex resistance. Then in 1957 a major breakthrough in cellusosic research made possible development of Tyrex, a new viscose yarn.

Tires made with Tyrex have shown extra-ordinary high speed performance and tread wear characteristics, in addition to softer and quieter riding qualities.

Underlying the search for longer lasting, tougher cord for tires is the basic desire to give greater safety to motorists. Modern Tyrex cord practically eliminates the danger of blowouts. Its fibers actually grow stronger as road friction raises tire temperatures.

In addition to automotive and truck tire uses, a growing number of newer applications have been found for Enka high-tenacity yarns, such as power and conveyor belting, high-pressure industrial hose, wire covering, and rope.

The emphasis on research at Enka has not been on tire cord alone. The modern Enka Research Center, built at a cost of two million dollars and occupied in 1956, is a centralized location for a research staff of more than 200 scientists and technicians who are seeking new ways to improve the properties of cellulosic and man-made fibers. The center symbolizes Enka's faith in research as the cornerstone of growth and progress. The staff is equipped with facilities to meet the challenge of a highly-competitive industry in which success depends on keeping abreast of new developments, improving present products and developing new products.

A large number of products used in daily living are made from Enka rayon and nylon. Many well known companies buy the firm's yarns and fibers for subsequent processing into finished products which are distributed on a national scale.

Enka's rayon textile yarns are used extensively in the manufacture of dresses, suits and linings, sportwear, under garments, curtains, shirtings, tie fabrics, ribbons, laces, braids, and broad and narrow woven fabrics. Draperies, carpets, and upholstery fabrics made of rayon have also gained wide acceptance.

Looking toward the future of the newer man-made fibers, Enka completed a nylon plant at Enka in 1954. Its textile nylon has gained acceptance in such end uses as intimate apparel, hosiery, blouses, sportwear, sweaters, upholstery, carpeting and automotive interiors.

Company directors authorized in Dec. 1958 a $7,500,000 expansion of nylon facilities which will double capacity. This will be Enka's second major expansion program—the first was completed in June, 1958—since production was begun less than five years ago.

Construction has begun and the new addition will go into production by early 1960. When the enlarged installation is in full operation, plant personnel will be increased by more than 300 employees.

In promoting the sale of its nylon, Enka claims that it is a "new and very different nylon," with advantages in softness, luster and affinity for dyes.

As part of a program to broaden the base of Enka's operations, a management group is functioning to investigate and promote commercial possibilities in fields and products in which the firm is not presently engaged. In March 1958 Enka acquired a controlling interest in the Rex Corporation of West Acton, Mass., a producer of plastic covered wire and cable and ultra-high frequency insulating material for the communications and electronics industries.

The purchase of The William Brand & Co., was the development of Tyrex, a new viscose yarn. announced in January, representing Enka's second acquisition. Brand, with plants at Willimantic, Conn., and Santa Monica, Calif., produces diversified types of plastic covered wire and cable.

Another development important to the Asheville area is the announced plan to move Enka's administrative offices from New York City to Asheville in early 1960. A new corporate office building will be erected at Enka and approximately 50 persons will be transferred.

Among Enka's well-known products are Jetspun, a solution-dyed rayon yarn which is used in home furnishings, men's wear, women's and childrens' apparel, and automotive fabrics.

In 1958 Enka began production of a new filament rayon yarn which utilizes a special bulking process developed in its research laboratories. This new yarn, known as Skyloft, was developed for decorative upholstery, drapery fabrics and carpeting.

In 1955 and 1957 Enka was ranked among the nation's 500 largest industrial corporations by the Fortune Magazine directory.

A sizeable number of Clemson graduates, particularly those of the School of Textiles, are employed by Enka. Enka Plant Manager, E. M. Salley, Jr., is a 1927 Clemson graduate.

Enka's wage and salary structure and employee benefits programs rank among the highest in the textile industry. In December 1958 pay increases amounting to an estimated $650,000 annually were granted its employees.

The Company takes pride in offering career employment. More than 800 employees have over 25 years service.

Through The Enka Foundation, 15 college scholarships are awarded each year to outstanding high school seniors in the plant areas. During the 1959-60 term, 37 students will be attending college on Enka scholarships.

To meet the needs of community welfare, charitable and character-building agencies, American Enka and its employees contributed and pledged more than $60,000 last November to 1959 fund drives in plant areas.

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Plant Engineering As Viewed By Management

Thomas B. Phillips, Jr. **Clemson College, T.M. Class of '57**
Woodside Mills, Greenville, S. C.

In today's modern missile and machine age, we have but one word for technology—**engineering!** Until just recently we have thought of engineering in an entirely different perspective from the engineering of today. Prior to World War II an engineer was seldom seen in a textile operation. Today, if there aren't several in one of our modern plants every day, then we may safely assume the plant is closed and operations suspended.

During the past few years the increased importance of engineering has resulted from the perpetual industrial revolution in the textile industry. As the industry has continued to modernize its equipment and facilities, its personnel has been modernized also; not by choice, but by demand. Equipment and machinery have become more complex, more delicate and in general more difficult to service and maintain.

This demand has called for more skill and more technical knowledge and in order to supply this skill and knowledge, the engineering field has been broken down into varied branches of engineering. With these specialized fields of engineering we are getting better engineers that have a broader and more detailed knowledge of specific fields. However, to be effective, this skill and knowledge must be combined with good managerial qualities. Not only must they be good engineers, but they must be able to plan, organize, and supervise all of the various phases of engineering for which they may be responsible.

Management feels today that each engineer should broaden his perspective of his own job to the point where he recognizes that the best kind of engineering is **managed engineering.** (We might remember at this point, that the man who knows "how" will always have a job but the man who knows "why" will be the "boss.")

No matter how good an engineer or manager, a man may be, if he falls behind the "wheels of progress" he becomes as out of date as last year's automobile is today. Advances are being made in modern engineering practices every day, and each engineer must strive to progress with these advances. He can best improve his, and his company's position by constantly looking for new and improved practices and applying this knowledge to the problems that will arise each day.

Now that I have more or less generalized on engineering as a whole, let me be more specific. Plant engineering may be broken down into several different phases, depending on the type of plant product, etc.

The four most important engineering fields in our plants today are:

(1) Mechanical
(2) Electrical
(3) Chemical
(4) The usual quality control and industrial engineering departments

All are of equal importance to the plant.

Mechanical engineering includes the maintenance of, as well as the basic principals of operation of all machinery and auxiliary equipment. A good maintenance program today can be one of a plant's most valuable assets. With supply and labor cost at an all time high, profits may be quickly consumed through lack of an effective maintenance program. The efficiency and operating cost of each machine in the plant can be controlled very closely with established preventive maintenance policies. Every engineer should adapt a preventive maintenance program to comply with his individual need.

Before new machinery or equipment is purchased, the engineering aspect of it should be carefully considered by management along with the engineers. Careful planning and preparation will be necessary to insure optimum efficiency. If technical training is necessary for the operation of new equipment, then a concerted effort should be made by all concerned to obtain the best available. Close cooperation between management and engineering on new ventures is essential if it is to be a success.

Modern machinery has called for more closely controlled operating conditions. Therefore, industrial air conditioning has become an important feature of textile plants today, not only for ideal operating conditions, but for employee morale as well. To operate and maintain a unit large enough to serve a plant usually requires the full time service of one or more technicians, who may also be responsible for controlling the humidity as well as the temperatures, since they are inter-dependent. First of all these engineers must be given technical as well as on the job training. After becoming thoroughly familiar with the units, the engineer should establish definite maintenance schedules and periodic cleaning. Any failure of the air conditioning can and will be very costly, not only in repairs but in production losses as well. Periodic inspections, both before and after maintenance is performed, will eliminate or greatly reduce the failures that are so common today.

Since electricity is almost the sole source of power in the plant, the electrical system is not only a complicated one, but is tremendous in size. A great deal of skill and nerve is required to handle the high voltage coming into and traveling throughout the plant. There is no limit to the amount of precaution to be exercised in working with electricity. Safety is first and foremost on any job, but few jobs in any industry are as hazardous as those of electrical workers. Again, we must point out how important planning ahead and organization is in this phase of engineering. Failure to plan ahead can be costly to the point of one's life in this instance. Accurate records should be kept on maintenance performed and frequent inspections made of all lines, switches, transformers and electrical outlets. Preventive maintenance must be exercised completely if major disasters and losses in production are to be avoided.

A great deal of time, energy and money can be saved each year with a concentrated effort directed at the electric motor system throughout the plant. Through periodic inspections and accurate records on individual motors, we can increase motor life and efficiency, eliminating many expensive replacements and repairs.

Lighting too, can be a major item in the overall efficiency of a plant. A poorly lighted area or improper arrangement of light fixtures can be detrimental in many ways. It may be an area in which inferior goods are produced constantly because the operator doesn't have sufficient lighting to detect the bad work or cannot see well enough to correct it. Parts that require lubrication may be hidden and unnoticed until trouble arises.

A dimly lighted place is also a constant safety hazard that may contribute to, or cause a serious accident. Adequate and proper lighting is an absolute must in any plant.

As you have probably noticed I have stressed plant maintenance in its entirety. I could write for hours and still not cover all of the necessary details that should be stressed, but since maintenance is one of the most important functions of our plant engineers, it should be stressed constantly and emphatically. Plant engineering today is better than ever, but not good enough. For "sputnik age" equipment and machinery, we will need "sputnik age" engineers.

We have other fields of engineering which I have hardly mentioned, not because they aren't important, but because they are not directly related to plant engineering as I have attempted to present it in this article.

Chemical engineering is very important to the textile industry today. The synthetic fiber manufacturer depends entirely upon his chemical engineers to develop new fibers and we, the manufacturer, depend on the engineer for manufacturing specifications. A new fiber can stipulate the synthetic market in many ways, creating new markets, and opening new avenues for textile products. The chemist is also the backbone of the greige goods finishing operation. Through him we get new finishes and increased sales.

As our markets have become more competitive and demanding of the producer, we have had to constantly improve quality as well as quantity of production. As a result our quality control engineers have been developed to constantly test the product as it progresses through each step of the manufacturing process.

Our industrial engineers too are busy with new floor plans and machinery layouts for a better stock flow and improved methods. They will be establishing new production standards which will require close cooperation from everyone if these standards are to be met.

From this you may wonder how a plant was ever operated without a staff of engineers. A mechanical engineer for maintenance and equipment problems, an electrical engineer for the power plant, a combination of the two for air conditioning and humidification. Advice from consultant engineers, salesmen and other staff engineers. The day of water wheels have long passed and to replace it is the turbine and the atom in the future.

Today's modern plant cannot be operated without its engineers. Both management and the engineers can grow and progress with the industry through close cooperation and a determination to make **your plant** and **your company** a **leader** in the **textile industry.**

GREENWOOD
MILLS

Eastman Chemical Products, Inc.

The most recent new fiber development of Eastman Chemical Products, Inc., a subsidiary of Eastman Kodak Company, is KODEL, the new, superior polyester fiber announced September 10, 1958, which will be marketed to consumers this Spring.

KODEL (Ko.Del'), a registered Eastman trademark, is a product of the Tennessee Eastman Company, corporate associate of Eastman Chemical Products, Inc., and a division of the Eastman Kodak Company.

The fiber is a completely new one, unlike any other, and many years of work by Eastman chemists and fiber experts having gone into its development, with many different types of polyesters having been invented, examined, and rejected by Eastman before determining that KODEL possessed the necessary end use qualities.

KODEL significantly extends the range of fabrics and apparel that can be classed as wash and wear and easy care. What is even more important is that garments made of KODEL, blended in proper proportions with other fibers, have demonstrated a remarkable ability to stay fresh and neat in appearance, because they have less tendency to muss and wrinkle. They are characterized also by a pleasing, comfortable feel or "hand."

KODEL is the third in the family of Eastman fibers that already includes Estron acetate, Chromspun color-locked acetate and Verel modified acrylic fibers. The manufacture of KODEL is a logical and progressive step in Eastman's expanding role as a major producer of man-made fibers since the company entered this field more than a quarter of a century ago.

Counsellors of doom are not hard to find who point to the sharp and recurrent downturns in the textile industry and particularly to its apparently long-term declining trend. Eastman, as a fiber producer, is by no means insulated from risks, but the company's record to date indicates that an active research and development program, combined with modern production techniques and facilities, an alert marketing organization operating on sound merchandising principles, and resourcefulness in perceiving and exploiting opportunities, can serve as an antidote.

The unique properties of KODEL have generated considerable enthusiasm at the mill and converters which have participated in tests and evaluation studies of the new polyester fiber.

The resistance of Eastman KODEL polyester fiber to pilling is outstanding. A variety of new fabrics can now be produced in which pilling was formerly a critical problem. New fabric constructions, surfaces and textures from batistes and broadcloths through an entire range of Fall fabrics such as flannel, semi-mill finish and worsted-type suitings are now in process in blends featuring KODEL.

KODEL has a high resistance to heat. Fabrics made of the new Eastman polyester fiber may be ironed safely at temperatures as high as 425 degrees Fahrenheit. This is a higher safe ironing temperature than that recommended for most other man-made fibers. Fiber shrinkage in boiling water is less than 1 per cent. This means that consumers will have greater leeway in caring for apparel made of fabrics containing KODEL.

Adequate proportions of KODEL contribute excellent dimensional stability to fabrics in which the new polyester fiber is used, even without heat setting or other special processing. KODEL has high resilience and toughness. It provides outstanding crease retention and wrinkle-resistance.

The low specific gravity of KODEL results in increased cover in fabrics in which the new polyester fiber is used. This property of KODEL now enables designers to create fabrics having equivalent cover, firmness and appearance. It also makes lighter weight fabrics practical for garment manufacture and contributes to the comfort of the wearer.

Eastman KODEL is naturally white. It can be dyed readily either alone or in blends with other fibers. Eastman polyester dyes are recommended and give a full range of fast shades from pastel through deep tones, including the bright intense colors which are used extensively in women's wear.

KODEL performs excellently on all three standard spinning systems—cotton, woolen and worsted. Yarns may be spun in fine counts with good strength, levelness and character in either 100 per cent KODEL or in blends with natural or other man-made fibers. Fabrics can be loomed, dyed and finished on conventional textile equipment.

Tests and studies in the use of KODEL in various blends and in varying types of fabrics have resulted in the decision by Eastman to avoid establishing arbitrary blend levels of KODEL with other types of fiber. However, recommended percentages of the fiber in blends with other fibers are being announced periodically for new fabric types as performance studies are completed.

KODEL polyester fiber, initially, is being supplied in staple form only. It is being offered in 1½ denier, 3 denier, and 4½ denier per filament in semidull luster of any required staple length. Tow, although no available when KODEL was announced, will be available later this year. Fine denier filament yarns of KODEL fiber are also due for marketing in the future. Although recently introduced, KODEL, "the champion of all stay-fresh fibers," is being adopted by a number of apparel firms and will be promoted extensively in men's wear in Spring and Summer 1959.

Eastman's venture into the fiber business, and such related activities as dyestuffs, has proved a profitable companion piece to its associated activities in plastics and industrial chemicals. As such, it also occupies a significant place in the broad product diversification pattern of its parent, Eastman Kodak Company.

The plant at Kingsport, the home of the Tennessee Eastman Company, was established in 1920 by Eastman Kodak for the primary purpose of making methanol (wood alcohol), a chemical which, at that time, was important to the photographic business of the parent company. In the early days, wood alcohol was distilled from the waste of timber cut in surrounding forests; the timber itself was converted into hardwood lumber, and charcoal, ascetic acid and wood creosote oils were sold as by-products. These operations were discontinued in 1945.

Late in the 1920's, the production of cellulose acetate, was undertaken at Kingsport for use in the manufacture of safety photographic film base, for the Kodak plant in Rochester, N. Y. This is now the basic raw material used in the manufacture of a number of important products such as all of Kodak's safety film; Estron and Chromspun acetate yarns, both of which are well known in textile uses; and Eastman cellulose ester plastices, trademarked Tenite, which are used by plastics molders and extruders in a wide range of industrial and consumer products.

In the early 1930's, the parent company began to center more and more Eastman chemical manufacturing operations in Kingsport. Today, Tennessee Eastman Company is a major United States producer of a number of important industrial chemicals. This plant is now one of the largest single industrial units in the south.

Initial success in the development of new products and manufacturing techniques at Tennessee Eastman Company resulted in part from research conducted by Eastman Kodak Company. More recently, Tennessee Eastman Company has carried on independent research on new products and processes, as well as the improvement of old ones. The company maintains complete facilities for basic research and development work to build a better, and more productive business. KODEL, like Eastman's other products, evolved from this forward-thinking policy.

To further strengthen Tennessee Eastman Company's position with respect to raw materials, Eastman Kodak established Texas Eastman Company at Longview, Texas in 1950. This new division of the parent company processes natural gas to produce ethyl alcohol and butyraldehyde, two chemicals which are required in large quantities at Kingsport. From this beginning, Texas Eastman Company has already expanded. It is currently producing large quantities of polyethylene plastic and has added a number of important chemicals, some used by Tennessee Eastman Company and others sold on the open market.

Verel, Eastman modified acrylic fiber, was announced to the trade in 1956. Since that time, it has been used in such diverse products as pile linings and outer coat shells and in luxurious floor coverings.

In 1938, Eastman introduced the first of what has become the widest range of acetate dyes offered by any company in the world. Eastman was the first company in this country to offer, in 1951, a solution-dyed acetate fiber, marketed under the name Chromspun. In Chromspun, the textile industry had, for the first time, a light-fast, gas-fast, non-crocking acetate fiber in a comprehensive range of built-in colors, giving new dimensions in flexibility of styling and color fastness for both apparel and home furnishings uses.

In 1952, Eastman began production on a large scale of highly specialized acetate tow for use in the manufacture of cigarette filters.

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A Man Among Men . . .

P. S. BAILEY

Gentleman
Industrialist
Philanthropist

By: Claude A. Crocker

Mr. P. S. Bailey receiving an Alumni Citation for his "outstanding accomplishments in the field of textiles. Pictured here from left to right are: Alan B. Sibly, Dr. Marshall W. Brown, P. S. Bailey, and F. E. Grier.

On December 17, 1958, the town of Clinton, the state of South Carolina, and the textile industry suffered an irreparable loss in the untimely passing of Putsy Silas Bailey, president of the South Carolina Textile Manufacturers' Association.

"Si" as he was affectionately called by his wide circle of friends continued to grow in stature and prominence in his extremely wide range of interest until his death at the comparatively early age of 54. Few men have been more active in so many fields, and still fewer have excelled in all of them.

Like all the Baileys, he was born in Clinton. He was the only son of P. S. and Fannie Copeland Bailey. While he was still young his father died and his uncle, W. J. Bailey, took over the education of the young man. From the public schools he entered Wofford Fitting School in preparation for higher learning. Next came McCallie School for Boys at Chattanooga, Tennessee, and then back to study at Presbyterian College for an A. B. degree.

He was graduated from P. C. in 1926 and the president-uncle immediately put him to work in the textile business—as outside cotton overseer. The job's title was confusing. Actually the young college graduate maintained repairs to the homes in the village.

After a year of outside work he was transferred to the inside as a shipping clerk. Mr. Bailey never considered the move a promotion, although it did afford him a better opportunity to learn the family business.

In 1931, he was married to Ouida Carolina Cox of Clinton who survives as does one daughter, Emily Frances Bailey, a student at Agnes Scott College, Decatur, Georgia.

General office work came next in his grooming for greater responsibilities. After some 12 years following his association with the organization his uncle considered him ready for vice-presidential assignments and so appointed him—the year was 1938. Frequently, Mr. Bailey would wryly recall how his uncle put him, as a young man, "through the mill," literally and figuratively.

Even though his guadian-uncle showed absolutely no favoritism to the young man, he did show great belief in him. The uncle's faith and training paid off—they were instrumental in developing one of the most outstanding textile executives the industry has known.

Upon the death of his uncle in 1948 he became President of Clinton-Lydia Mills. The following ten years were those of modernization and progress. Through his enlightened and progressive leadership he lifted the mills to a position of leadership in the industry. Today the mills have a combined count of 172,640 spindles and 3,994 looms.

Mr. Bailey's proficiency in his field was recognized by his fellow manufacturers, who just last year elected him President of the South Carolina Textile Manufacturers' Association. In addition, he was a director of the American Cotton Manufacturers Institute, Inc. He also was a director of the Institute of Textile Technology in Charlottesville, Virginia.

Badly as Mr. Bailey is already missed in the textile manufacturing industry, there are three other prime areas in which he is missed even more; the Town of Clinton, Presbyterian College and Thornwell Orphanage. His name was synonymous with their progress and prosperity.

There were not any worthwhile civic endeavors in Clinton in which he did not take a leading part. The many honors bestowed on him for his unselfish work are for too numerous to enumerate.

At the age of 30, he was elected mayor of his home town, a post which he held from 1934 to 1946—a period of twelve years.

He was a member of the Board of Trustees of Presbyterian College, being chairman of its building committee. He was a member of the Board of Trustees of Thornwell Orphanage and chairman of its executive committee.

He was an elder in the First Presbyterian Church. Not only did he serve these institutions in official capacities, but also he shored them up with his financial contributions.

His success carried over into his hobbies. Some years ago he developed several hundred acres of eroded, unproductive land into what became internationally known as "Creekland Farms", one of the finest short horn cattle farms in the nation. He was the breeder of "Creekland Lancer," who was named International Shorthorn Champion at the 1955 Chicago Exposition.

Until his passing the name of "Bailey" has been on the door of the President's office at Clinton and Lydia ever since his grandfather, Mercer Silas Bailey founder of the organizations. Clinton in 1896 and Lydia in 1902.

The door of his office was always open and there is no record of any employee in his plants failing to see "the head man" when and if things seemed to be going wrong.

Si Bailey did not stand on ceremony. He was friendly and informal. Many of his employees called him "Si" and his dignity suffered not the least bit because he was a man with the common touch.

Silas was the last of the Baileys to head the family textile dynasty.

While it is true he was the last to bear the family name, the name P. S. Bailey will never become blurred in the textile industry's history.

In the memory of all who knew him Si Bailey will live on and on. Men with such a rare combination of understanding, generosity and humility are a rarity in an age or industry.

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Some Basic Thoughts On Management

Robert S. Small
President of Woodside Mills
Greenville, S. C.

In selecting the topic "Management" I will treat it in the broadest terms. It is a topic in which each of you, I am sure, is vitally interested. For, after a reasonable period of apprenticeship each of you will assume the responsibility of management with different degrees of success from second-hand, overseer, superintendent, officer, or even owner. Recently, and in the past, many erudite articles have been written on the present day requirements necessary for a modern executive manager. Fortune Magazine has recently devoted several articles to the study of social, physical, and educational requirements of the modern manager. Of course, management standards and demand change, but there always have been and always will be certain fundamental requirements for a successful supervisor at whatever level he may manage. Any person be he president or second-hand, owner or staff executive will have to perform successfully the three basic principles of management. He must **Organize, Authorize,** and **Supervise.**

These simple principles are elementary to any textile graduate. But, the degree of success with which they are applied vary mightily and determine to a large extent the degree of his success. Often the simplest of principles offer the broadest challenges. Let me give to you my interpretation of these principles:

Organize — Basically management is the same whether one is managing a department, a mill, or a company. To organize your department one must have a thorough understanding of its machinery, its personnel, and the capabilities of each. He must know the limiitations of his machinery and personnel, and then organize his department to offer maximum flexibility to meet day to day contingencies of both men and machines.

An early admonition to any prospective manager is to study the personality of his company. Every successful company has a personality; that is, a certain way of approaching their organizational problems, of reporting, of employee training, of sales approach, of financial demands, of standards, of machinery replacement, and others. Mills A, B and C each will approach and resolve these matters differently—one method essentially is probably no better than the others, but each company for many inherent reasons develops their own methods, but suited to them—it is well to understand your company's method of approach, its so-called personality, and organize your department to conform.

Authorize—means to give authority. But to give authority one first has to clearly define what authority is being given. Obviously before authority is given the department personnel must be trained thoroughly and clearly in what will be expected of them. In order to do this successfully the supervisor must understand his organization and must utilize the staff departments that are available to him. Even if he understands his organization and its objectives it is essential that he be articulate enough to effectively translate them to his employees. The greatest area of misunderstanding is in the lack of clarity in defining the authority given.

Supervise—two words "FOLLOW UP" could embrace supervision—don't forget them—they are the two most important words in manufacturing supervision.

But, there are many other supervision prerequisites. A good supervisor must have imagination, without it he and his job will stagnate; all problems are different and one must have the imagination to solve them. Imagination is the ability to **do,** to resolve.

A good supervisor can never be satisfied with anything less than perfection. If he is complacent with, or permits inferior performance, his whole job will soon reflect it.

He must be flexible in his thoughts and actions, ever alert to competitive changes in machinery, methods, and personnel. Much has been said about a broad educational base rather than or supplementary to a technical education. It is in alertness to competitive changes and their acceptance, where to go to get answers, that the advantages of broad study are most evident. All managers should be ever alert in keeping abreast of changing conditions both within and without his industry.

A good manager must supervise and utilize the staff functions available to him. He must see that all elements under his responsibility are directed towards an efficient, smooth running job which will give to the individual employee a sense of satisfaction, a pride of accomplishment, and a dignity of employment.

And, don't forget to "Follow Up."

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Outstanding Seniors . . .

By
Tommy Ariail

Lewis P. Miller, is a Textile Manufacturing major from Walhalla, South Carolina. Lewis is married and is attending Clemson as a day student. He served with the Navy from 1950-1953.

Lewis received scholastic high honors his first semester of his junior and senior year, and he also received honors his first semester as a sophomore and second semester sophomore and junior years.

Lewis' experience in the textile industry was gained by working two and a half years at the Excelsior No. 2 in Clemson, and the summer of 1956 at the Utica Mohawk Mill in Clemson.

Lewis has used the G. I. Bill to help pay his way through school.

Joon Ki (Junekey) Lee, a Textile Manufacturing student with Knitting as his major course, is one of the most outstanding foreign students in textile school. He is from Laegu, Korea, and before starting his college studies he served three years in the Korean Army.

Junekey has gained very valuable experience in the textile field by working at many different plants. He worked for La France, S. C., during the summer of 1956. From September to November, he worked for Gerli & Co., in New York; his work for this company was done in his own country of Korea. He later worked for Kyungbook Doupion Silk Co., in Korea until the first of the year 1957 then he came to Clemson for his studies.

Junekey has been on a full scholarship since 1957 from La France Co., of New York.

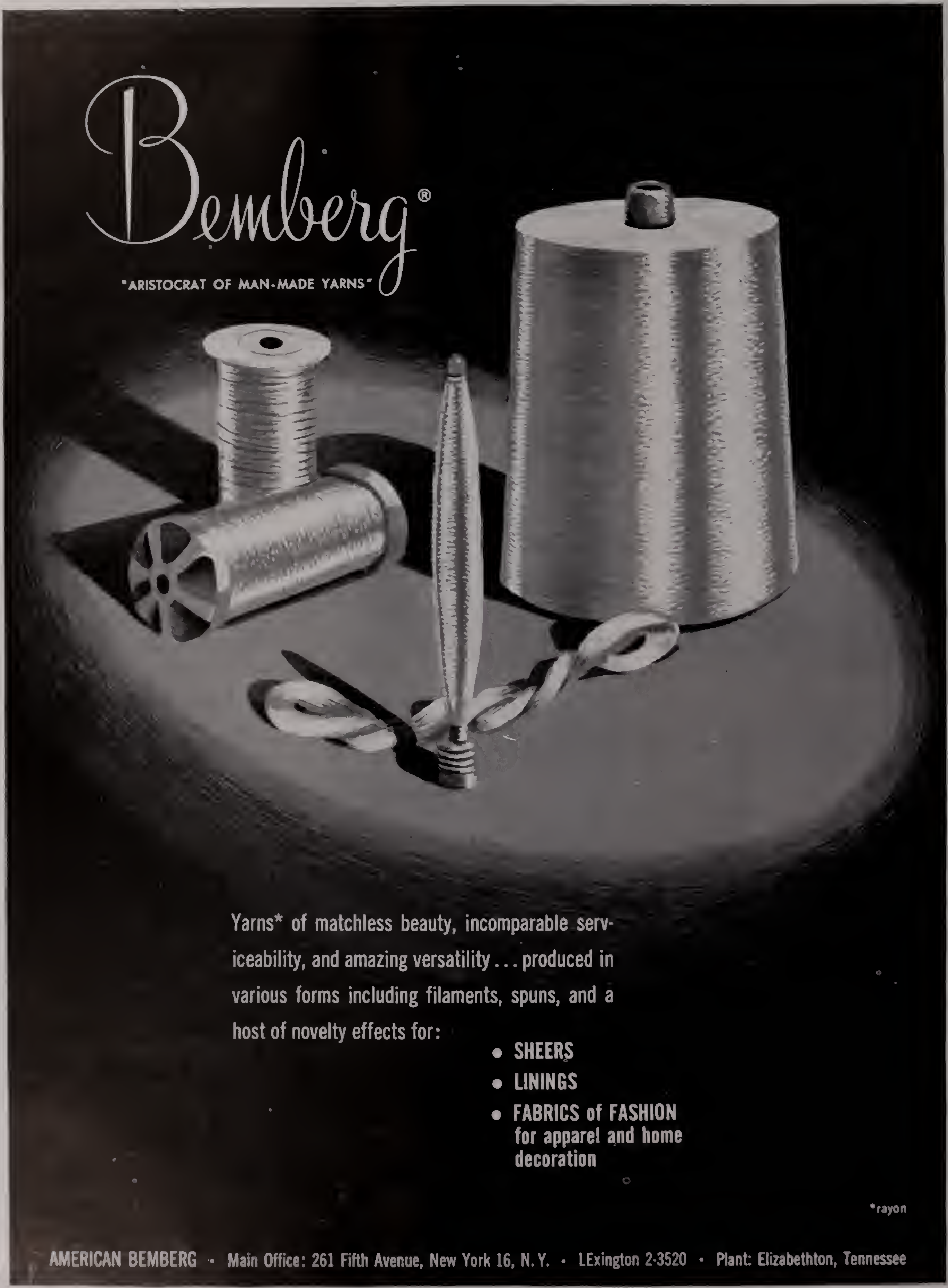
J. D. Tucker, better known around the campus as Pete, is a Textile Manufacturing senior from Inman, S. C.

Pete has been very active in the ROTC program at Clemson. He served as a 1st Sergeant his junior year, and is an Executive Officer of the 2nd Battle Group this year. He was also a Distinguished Military Student this year.

Pete was a member of the Pershing Rifles his sophomore year; Executive Sergeants his junior year. He is also a member of Scabbard & Blade and Phi Psi.

Pete has gained experience in the textile industry by working for Drayton Mills in Spartanburg for the last four summers.

He has been helped with his school expenses by the Keever Starch Scholarship, and he has served as a hall counselor.



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ACMI Views 1959 With Hope

The president of the American Cotton Manufacturers Institute, Halbert M. Jones of Laurinburg, N. C., says that the U. S. textile industry views 1959 with more optimism than it has been able to muster since the beginning of the decade. He noted these points:

1. A considerable improvement in textile markets in the last few months.

2. Textile securities, in many cases, are on the rise and stock market analysts are recommending

3. A determination on the part of textile manufacturers to produce and merchandise more effectively.

4. An apparent change in the attitude of the government toward textile industry problems as indicated by public statements of federal officials.

5. Recent support given the textile industry's position by national publications.

6. The continued improvement of the nation's economic health.

"That last point," Mr. Jones said, "may be one of the most important because the textile industry was beginning to come out of its private recession when the national economy slipped into one of its own in 1957. Textiles followed the national downward trend in 1958.

"Our optimism, however, is tempered by the continuing threat of increasing textile imports from low-wage countries, but if these can be effectively controlled, and if a competitive one-price cotton policy is adopted by the government, the textile future is bright."

"Two-Price" Cotton Plan Called Unfair To Industry

There has been a break in the federal government's attitude toward two-price cotton, which has been a thorn in the side of the textile industry for some time.

Frederick H. Mueller, undersecretary of Commerce, condemned the present pricing system during testimony before a Senate subcommittee investigating the problems of the textile industry as they relate to government policies.

Mueller said that "it is certainly unfair to ask any industry already in difficulties to pay more for its raw material than its competitors in the world market by virtue of action of our government."

The two-price system permits foreign manufacturers to buy U. S. grown cotton, taken under the price support program, at a cost 20 percent below the price to manufacturers in the U. S.

Mr. Mueller told the subcommittee that "we in the Commerce Department hope that before too long there will be a single price for U. S. produced cotton. This desirable goal must be worked out by the Congress in its consideration of the total farm program."

U. S. manufacturers have long pointed to the two-price system as one of the chief contributors to the textile industry's problems. The system has been a target of the efforts of the American Cotton Manufacturers Institute.

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May every success be yours in the industry which will play such an important part in your future — and in ours.

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Roy Keaton
Director General, Lions International

1958 January Issue "Lion Tamer"

Yes sir, your personality is really showing, and it is revealing the **real** you. In fact, it is on exhibit 24 hours a day at all places and at all times. Your personality is your outward manifestation of your true inner-self and nature. And it is perhaps of infinitely more value to you than any of your other human traits. Your personality is definitely **aiding** or **hindering** you.

Dr. Eliot of Harvard wrote, "there is in a man a ruling characteristic essence or spirit, which is the the man himself; and this spirit, dull or bright, petty in the voice, and expresses itself in the manners of the individual. This is the individual's personality." Regardless of who you are or what you are, you need to pause and ponder the tremendous importance of developing and maintaining a pleasing, affable and radiant personality. Its development should receive your constant consideration and care, for it is not a gift, it's an attainment. Properly developed, it can be your most priceless asset. It can aid you in becoming just about anything your heart desires.

Personality does not mean appearance nor looks. Neither is it what others think of you. It is your true character manifesting itself.

We are told that some years ago a large university carefully selected 100 male students from its graduates on the basis of their extremely high grades, while another 100 men students were selected for their outstanding personality traits. As far as possible, systematic records were kept on the earnings of all the individuals in each group for a period of 10 years. At the end of that time it was found that the 100 men selected solely on the basis of their conspicuous grades were earning an average income of $8,000 per year while those selected for their prominent personalities were earning an average of $13,000 per year.

It isn't intended to infer that high marks in school are not important, because they definitely are. But the student who excels in his grades and also excels in helpful personality qualities, and who actively participates in various school activities, has a distinct advantage over the student who concentrates on high marks alone.

It has been proved again and again that leaders with radiant personalities outdistance those who lack the essential human relations factors, even though they may possess superior intellects.

The Carnegie Foundation, reporting on an extensive 10 year study, stated in part, "A successful concern today is not so much a battle between possessors of money as a contest of outstanding personalities." This is also true of all types of leadership because the personality of every leader is now, always has been and always will be of vital importance.

You may live to a ripe old age and travel to the remote corners of the Universe, you may fraternize with royalty and wine and dine with nobility, but the most important acquaintances that you will ever make is with yourself. A person has a lot to learn if he has never sat down alongside himself, never introduced himself to himself, or looked himself squarely in the face or talked things over intimately when alone. Yet, these are essential if you desire to develop and improve your personality.

Pope wrote, "The proper study of mankind is man." The trouble with most of us is that we spend too much time studying the wrong person—the other fellow, and not ourselves. Self-knowledge is not only imperative, but essential as a condition for the development and improvement of one's personality. One must constantly analyze his own impulses, his own tendencies, attitudes, motives and characteristics.

It is not only possible to develop and improve personality, but it is also possible to literally transform it. Its quality is determined by what your mind does with the material your five senses bring into it. Every one of your senses is like a broad highway laden with all manner of things—both good and bad. You alone make the selection. You have the power of creative forces within you. Through the exercise of your imagination and under the control of your will, you develop your personality.

St. Paul wrote, "Be ye transformed by the renewing of the mind." There is nothing complicated or new in the process. The miracle of a transformed personality is no greater than the metamorphosis of a caterpillar into a butterfly. Both are natural processes. Your mind, like your body, grows by what you feed it. Imagination rules the world. Imagination is the great architect. Will is the supreme designer. Together they work miracles. You determine whether you "build castles in Spain" or erect hovels of mud and straw.

Is your personality an asset or a liability? Progressive leadership demands strong personality. A good personality can be more helpful than knowledge, more persuasive than the law, more potent than praise, more expressive than speech, more influential than facts, more desirable than honors.

H. G. Wells wrote, "The past century has been the supreme century of material achievement. In the present century we shall start a far greater job. Instead of making more wonderful machines, we shall try to make more wonderful men. To do this we are going to turn our attention toward ourselves and inside ourselves."

Observe yourself. Give daily attention to your personality improvement. No matter what your occupation, profession or station in life, the more attention you give to improving your personality, the more rewarding it will be for you. Your personality can mean the difference between a life of mediocrity or one of success.

Someone has said, "Character is what you are in the dark."

Personality is the influence you exert on others. Remember, you are somebody. The Bible says, "You have been made a little lower than the Angels and crowned with glory and honor." Live up to it! Make your leadership and your life reflect it!

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TEXTILES:

A Future Unlimited!

By

Ralph J. Bachenheimer
Iselin-Jefferson Company, Inc.

and

Chairman of the Textile Section of the
New York Board of Trade

Few industries can offer greater challenges or higher awards than those available to capable young men entering the field of textiles. Opportunities are unlimited! Our industry is one of individuals and therefore the road to success is wide open for those who believe in the principle of free enterprise exercised by men dedicating themselves to the career they choose. There is no short cut nor a substitute for ingenuity, initiative and hard work, but for those who are willing to apply themeselves thoroughly the proper awards are easy to achieve.

What the textile industry needs is a new generation of young men coming along grasping its opportunities at the widest possible scope. Few industries as large and as basic as ours have consistently shown returns on an investment as poor as the textile industry. Textiles today are selling at levels below those of ten years ago, while the rest of our economy has undergone a continued period of inflationary price increases. We need new management which has enough vision to realize that it takes more than cutting a price, or to underbid a competitor, to return stability and profitability to textiles. What we need, and need badly and quickly, is a new approach whereby we stop apologizing for our products but go out and promote forcibly the many new fabrics produced in our mills. New fibers and chemical finishes given fabrics, properties unheard of just a few years ago, and yet none of these have helped to increase the profitability of this industry of ours to a point where it can compare with other major producers in this country. Bold and imaginative selling, coupled with a willingness to attract a larger share of the consumer dollar from other industries can easily change the mistakes of the past and today.

Promotion, selling and merchandising have undergone vast changes during the past twenty years. These changes have benefited our economy at large. We hope that all of you who are spending years in college training to acquaint yourselves with these changes will learn how to apply them in your life work after graduation and help lead this industry, which is the life blood of the South, to a brighter and more glorious future.

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High School Visitation Day At Clemson Set for March 21st

The high school visitation day at Clemson is a special day which is set aside for the high school students of the state to visit the different schools on campus.

The program for March 21 is as follows:

9:00 A.M.—Student Center
Informal Reception for Visitors

9:45 A.M.—Chemistry Auditorium
Welcome to campus, Mr. R. C. Edwards, Acting President

10:15 A. M.—Chemistry Auditorium
Visit School of first choice, tour conducted by student leaders and faculty members

12:15 P.M.—Dining Room
Lunch with students

1:00 P.M—Student Center
Optional visits and meetings

2:00 P.M.—Memorial Stadium
Intra-squad football game

The School of Textiles is planning to have a general meeting in the Textile Library after the groups come from the general assembly in the Chemistry Auditorium. A member of the faculty will talk to this group then there will be group tours through the Textile Building.

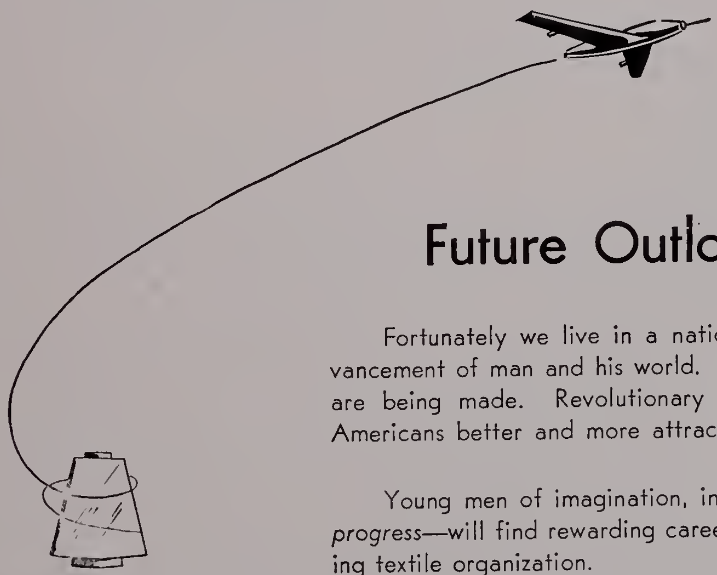
Student leaders and faculty members will guide these groups through the building, and answer any questions. Other students of the School of Textiles will be in each department of the building to demonstrate and explain the various machines.

Textile Market Feels Recovery

Market reporters in New York are noting a decided change of attitude on the part of cloth buyers, a change that is benefitting the textile industry.

Reports from the market say that buyers are purchasing quantities of cloth for delivery all the way through December, and premiums are being paid for some constructions for nearby delivery.

All of this has had the effect of firming the price structure of the cloth section of the market, New York business writers say, and an increase in prices is indicated.



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The NTMS Plans Field Trips

Planning a very active second semester, the National Textile Manufacturing Society met Tuesday, February 24 and discussed several projects.

The main project which they will undertake again this semester is the field trips to several mills, etc. The field trips in the past proved to be very interesting and helpful. Plans were also made to help the Textile School with their part of High School Visitation Day March 21. Guides for the Textile School will be provided and other members will be available to talk with any person interested in textiles.

Programs for the second semester were discussed in detail. Plans are being made to obtain some outstanding speakers from the textile industry to talk to the group. Also films on principal textile topics and other related subjects will be shown.

Tentative plans for a social or drop-in for one of the Spring dances were discussed. Such a drop-in was sponsored the first semester and enjoyed by all the students who attended.

The N.T.M.S. has had a very active first semester and will be busy in the second semester.

Professor T. D. Efland, the N.T.M.S. faculty advisor, has helped the club very much.

Textile Industry Is Regarded Essential

Halbert M. Jones of Laurinburg, N. C., president of the American Cotton Manufacturers Institute, has said that, "We in the textile industry are extremely gratified that the Office of Civil and Defense Mobilization, a powerful agency of the executive office of the President, has pointed out the fact that a further shrinking of the textile industry would threaten national security."

The OCDM issued a statement saying that the agency "regards the textile industry as an essential industry and considers it an essential part of the nation's mobilization base . . . In regard to the cotton and rayon broad woven industry, requirements and capacity are almost completely in balance, and further displacement of U. S. capacity could pose a serious mobilization problem. We will watch this situation carefully."

Mr. Jones said, "The statement of the OCDM . . . should serve as encouragement to the nearly one million persons employed in the industry that their jobs are considered as essential for the survival of this nation."

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(LaFrance Industries Foundation, Inc., offers a full four-year scholarship at the Clemson College School of Textiles to a son of an employee, on the basis of certain qualifications and a competitive examination)

Phi Psi Active At Clemson During Second Semester

Phi Psi Fraternity members will tour two textiles sites in the Spartanburg area on March 17. The Deering Milliken Research Center heads the program for the morning tour. Following lunch, the afternoon will be spent touring another site which is unnamed as yet.

This field trip is one among many activities planned by the fraternity for the second semester. Heading the list of activities is the tapping of new members qualifying for membership in the fraternity. To qualify, a Senior must be in the upper 1/3 of his class, a Junior in the upper 1/5 of his class, and a Sophomore must be one of the top two in his class. Those meeting these requirements include Charles C. Bagwell, TE; Bernard M. Brown, TM; James N. Eters, TC; Don W. Faile, TM; James C. Knox, TM; Thomas E. Lollis, TE; A. Frank McGuire, TM; and Claude W. Smith, TM. The two Sophomores meeting the requirements are James L. Adams, and Aubrey Motz, II.

Members of the fraternity will participate in the activities of High School Visitation Day which comes on March 21. Phi Psi, along with members of NTMS, will aid in showing the Textile School to the visitors on that day.

Rounding out the semester's activities will be the highlight of the year, the Phi Psi Convention. The convention will be held in Atlanta in late April. It is hoped that a large number of the local chapter will be able to attend.

Exports and Employment Fall In Textiles

The Textile Export Association of the United States has issued a report showing that 1958 exports amounted to 500,501,173 square yards.

It is interesting to note that in 1947 exports of cotton piece goods amounted to nearly three times as much as 1958 exports. And since 1947, 326,000 employees have lost their jobs in the textile industry. Textile industries in low-wage foreign nations are not only taking our overseas markets, but they are sending goods to the U. S. market in large quantities. Every yard of foreign cloth that comes in displaces that much work for an American textile employee.

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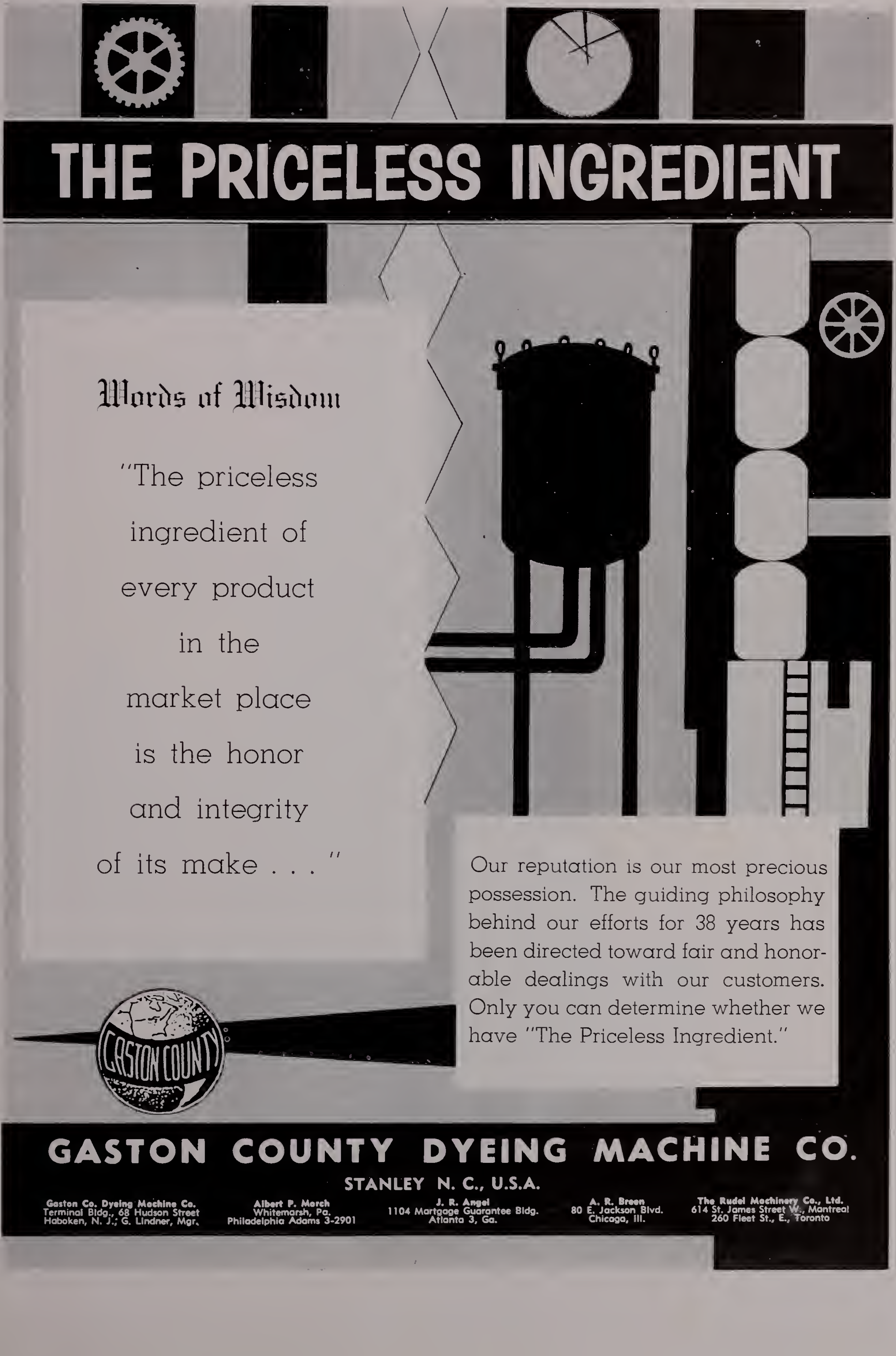

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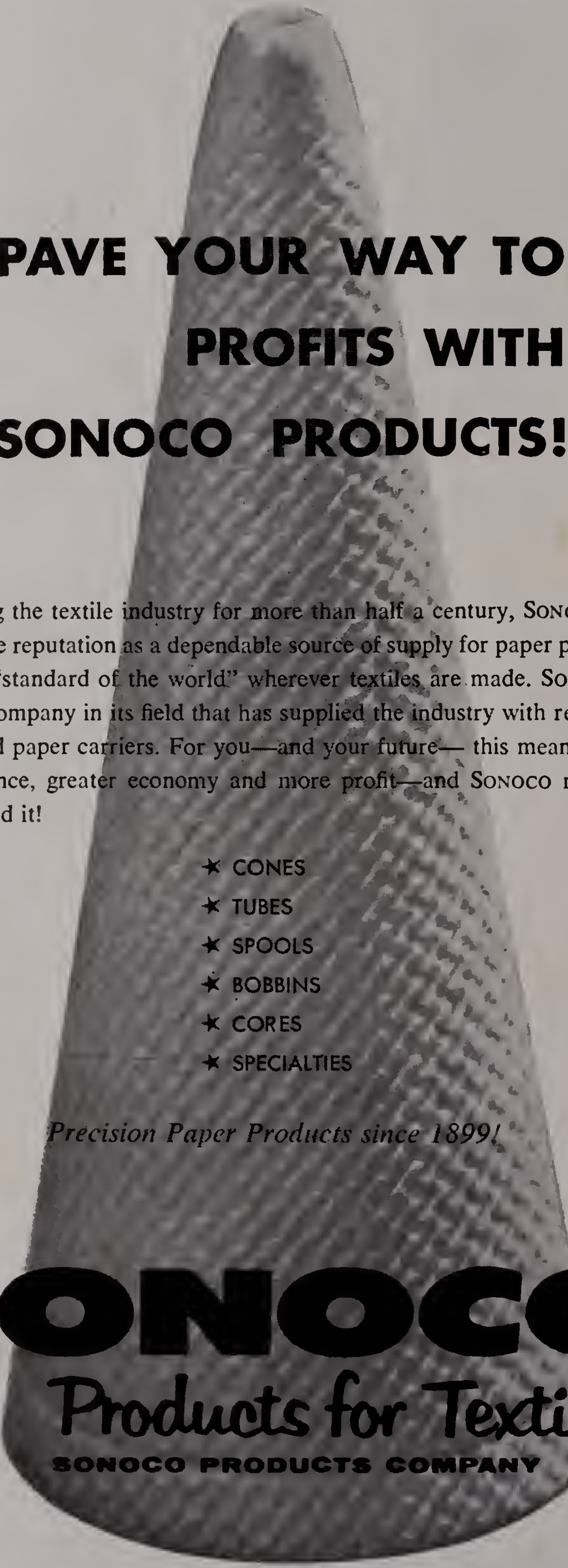

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Official Student Publication
Clemson Textile School

VOL. ~~16~~ 17 SUMMER ISSUE NO. 4

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THE BOBBIN & BEAKER. Organized in November, 1939, by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge four times during the school year by students of the Clemson College School of Textiles. All rights reserved.

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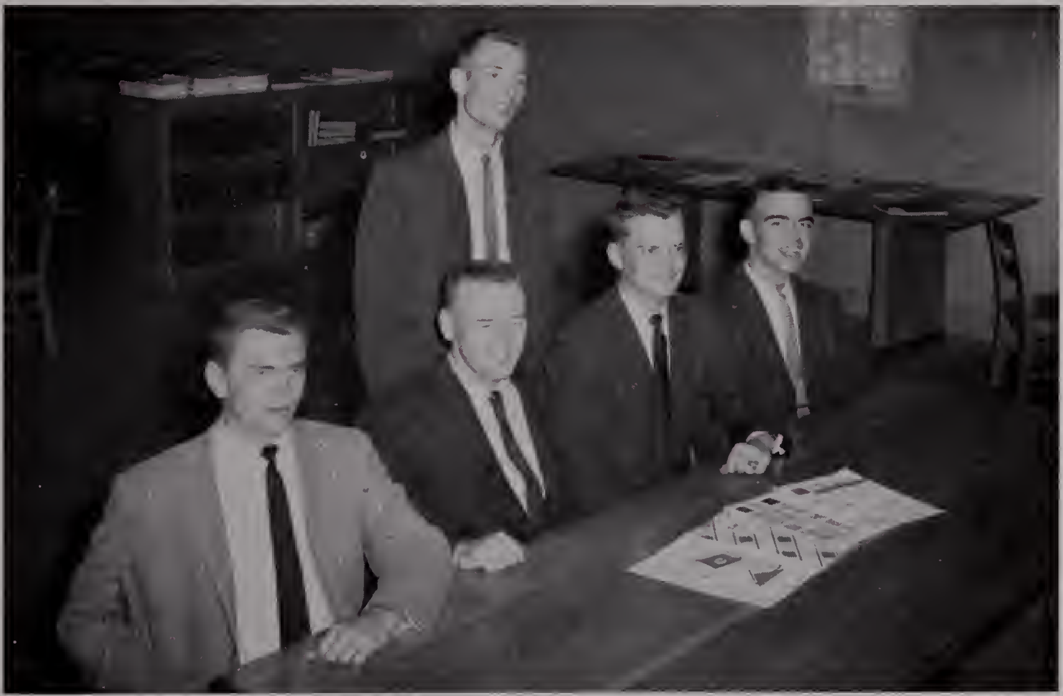
From The Editor

For our theme this issue we are featuring several of the prominent machine companies that are manufacturing textile equipment. Along with the articles on the histories of these companies you will find new and interesting information on products recently developed by them. These articles are rounded off by an excellent article on research.

This is the first of four issues to be prepared by the new staff pictured below. We sincerely hope you will enjoy this issue and future issues. Any suggesting or criticisms will be welcome.

—Alan Bell, Editor



The 1959-60 Bobbin and Beaker staff seated from left to right: Gordon Ferguson, Adv. Mgr.; Samuel H. Fleming, Circulation Mgr.; Charles Bagwell, Business Mgr.; Tommy Ariail, Managing Editor; standing, Alan Bell, Editor.

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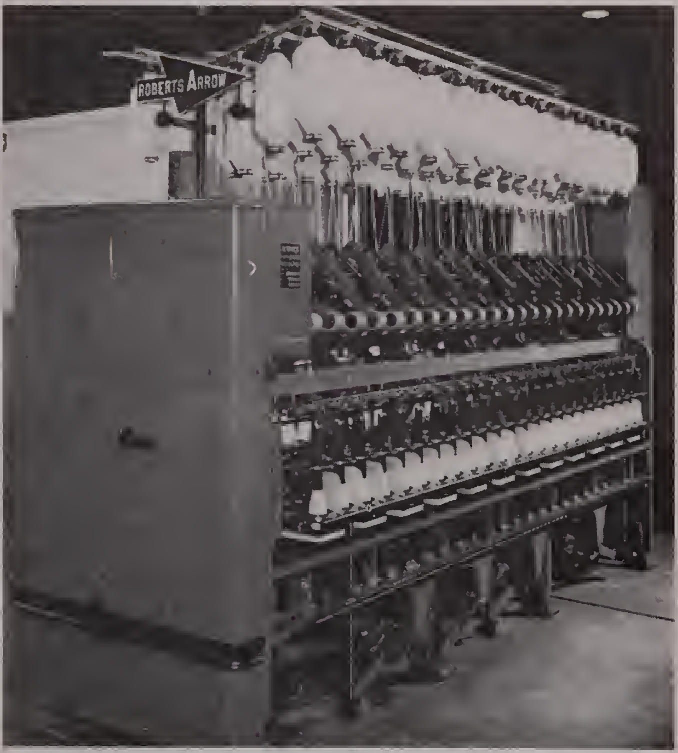
Roberts Arrow WM-2 Frame Opens Up New Long-Fiber Yarn Possibilities



Roberts Arrow WM-2 Frame

The Roberts ARROW Long-Fiber Spinning Frame is a precision-made new machine designed to open up the field of long staple spinning on a broader and more economical basis.

The most important and even dramatic innovation of the new frame is in the drafting system, where no changes in roll setttings are ever needed. Bottom rolls are permanently set in a fixed position in the roll stands. At the same time the Roberts PermaSet Drafting System can handle any fiber or combination of fibers in staple lengths ranging from 1-1/2" to 8", producing yarns that are very even in quality.

The outstanding characteristics of the new frame are:

—Versatility in spinning a wide variety of yarns
—Ease in changing yarn numbers
—Large packages
—High production speeds
—High drafts
—Excellent yarn quality
—Simplicity of operation
—Minimum of maintenance

The ARROW Long-Fiber Spinning Frame was first shown at the Southern Textile Exposition at Greenville last fall in 4-1/2" gauge, with 3" rings and an 11" traverse. The frame will be in operation at The Knitting Arts Exhibition in Atlantic City, N. J., the first week in May.

Since the first of the year at least two prominent American long-fiber mills have contracted for sizable quantities of the frame for spinning 100% worsted as well as blended and 100% synthetic yarns, and deliveries are now being made.

Production Flexibility

Changes from one yarn number to another are made with a minimum of adjustments. Better blending of the stock in process is obtained because of the high drafts used—drafts of up to 25 with wool and to 50 with synthetic fibers. Well blended and very even yarns are obtained at high front roll and spindle speeds. The large, heavy bobbins that are produced provide considerable cost savings in spinning as well as in succeeding operations.

A standard 240-spindle 4-1/2" gauge frame operates very smoothly with a 15-horsepower motor because of the complete ball-bearing construction in the head, drafting system, spindles, builder motion, undercarriage, and motor drive. Spring counterbalancing for the ring rails is standard equipment, for minimizing wear and for ease in doffing.

A simple arrangement permits the rapid changing of yarn numbers from 1/6s worsted count to 1/80s, of speeds, of drafts from 5 to 50, of turns per inch from 5 to 35, and of lay. Draft, twist, and lay constants are all easily changed with one master set of gears in the head.

Changes in amount of draft are easily made, in which a single wrench is needed to loosen only two nuts. For long runs of specific yarns, cradle pins with openings ranging from 3-1/2 to 7 millimeters can be selected and quickly changed over as required by the yarn diameter.

The front roll weighting is easily adjustable from 90 to 120 pounds. Front rolls and roll necks are made correspondingly larger to take the heavier weighting used. In addition, all four lines of Roberts Even-Grip Fluted Bottom Rolls are mounted in heavy-duty ball bearings which are grease packed for life. The ball-bearing top rolls also require no lubrication.

Changes in ring size can be conveniently made if desired. The double-channel ring rails are in unit construction so that the rings and holders may remain attached to the rails when removed from the frame, stored as a unit for later use, and the new-size units installed.

The wide-range variable speed drive used is very accessible for easy speed changing. A ratio of 2.2 to 1 is provided for spindle speeds, which can range from 5,500 to 12,000 r.p.m.

A remarkably simple arrangement permits rapid reversal of twist when needed. Two men can make the change in approximately one hour per frame. The motor is reversed simply by operating a self-contained drum switch inside the motor starter. It takes but a few minutes to move the swing arm in the head to the opposite side, to reverse the spindle direction. Since two ball-bearing tape tension pulleys are used on the WM-2 frame, tapes need not be shifted. The rest of the hour's time is used in reversing the balloon control rings—a procedure about as simple as setting the thread guides.

All of these constructional and operational advantages mean more and better yarn per shift, with a minimum of lost production when changing from one yarn number to another.

Typical Spinning Organization of a Yarn Run on the Long-Fiber Frame

Stock	**3" to 6" Orlon-Wool**
Yarn Number	1/27 (worsted count)
Hank Roving	2.2 Double
Draft	24.5
Twist Multiple	2.8
Turns per Inch	14.5
Ring Size, inches	3
Bobbin Length, inches	12
Traverse, inches	11
Net Ounces on Bobbin	14
Spindle Speed, rpm	7,000
Traveler Speed, rpm	5,500
Front Roll Speed, rpm	77 (2")
Probable Efficiency	97%
Pounds per Spindle Hour	.052
Doffing Cycle, hours	14-1/2

Compliments of

Abbott Machine Company, Inc.

WILTON, NEW HAMPSHIRE

Southern Office: Greenville, S. C.

Manufacturers of Textile Winding Machinery

Warner and Swasey -- 79 Years of Precision

New Warner & Swasey plant located at New Philadelphia, Ohio.
This modern manufacturing facility augments the output of the company's main plant at Cleveland, handling certain machining and heat treating work for textile machines and machine tools, in addition to serving as the production and assembly site for Gradall earthmoving equipment.

Known throughout the world as a builder of machine tools, textile machinery, construction machinery, telescopes, and other precision equipment, The Warner & Swasey Company of Cleveland, Ohio, continues to manufacture its products today on the very same site originally selected by its founders way back in 1881.

Worcester R. Warner and Ambrose Swasey, the company's founders, were both raised on New England farms. Both left the farm to become machinists apprentices at a machine shop in New Hampshire. That's where they became acquainted. And in 1880 they went west, to what were then America's industrial frontiers, and founded their own company.

They went first to Chicago; and, surprising as it may seem today, they could not at that time find enough skilled men that far west to operate a machine shop! So they moved back east to Cleveland, on the south shore of Lake Erie.

They invested in their enterprise $2,500 apiece.

Warner & Swasey immediately specialized in the manufacture of turret lathes—machine tools of universal use in metal working establishments—which remain one of the company's major product lines today.

In 1881 a large share of the demand for turret lathes came from manufacturers of pistols and rifles. Later, however, people learned of the possibilities of running water, and iron plumbing supply manufacturers created a new demand for turret lathes. Then along came sewing machines. Steam engines came into general use. Railways expanded, and lathes were needed to make locomotives and freight cars. Farm machinery developed, and there was another new market.

But one of the biggest fields in those early days was bicycles! It seemed as if all America was going to be riding on two wheels—and this required turret lathes in mounting numbers.

Then finally along came Henry Ford with his Model T automobile — and a new era began.

Today you will find Warner & Swasey machine tools in practically every nation on the globe, helping to produce every type of modern convenience, industrial equipment, and weapons of defense.

Amid their early struggles in Chicago to establish their company, the two founders miraculously found time to do something concrete with their mutual interest in telescopes and astronomy. For they built a remarkable new design telescope which attracted wide attention at Chicago's Industrial Exposition of 1880.

This fame in the field of telescopes followed the young firm to Cleveland, and during the five years in its new plant location the company built 14 telescopes and 13 observatory domes. Through the years the company has continued to design and build numerous major telescopes, the largest to date being a giant 82" instrument for McDonald Observatory at Mount Locke, Texas.

From its very beginning the company kept growing, but the greatest expansion arose out of the imperative necessity of World War II for the machine tools required to implement military production programs. In order to meet this need, Warner & Swasey greatly enlarged its plant facilities and skilled labor force, and proceeded to build its precision metalworking machines and specialized optical equipment at unprecedented rates.

When World War II was over, the company was faced with a problem. Should it dispose of its enlarged facilities and shrink its operations back to the pre-war level — or should it endeavor to enter new fields, to utilize its modern facilities, highly skilled craftsmen, and production know-how in building precision machinery.

The company decided on the latter program. It expanded its line of machine tools and it ventured into two new highly contrasting fields: textile machinery and construction machinery.

The Gradall, the first of the company's precision earth-moving machines, found ready acceptance. It is used in highway construction, in residential building, and for a host of miscellaneous industrial uses. Today the company makes an entire line of construction equipment, including backhoes, diggers, and trenchers. The latest is a giant machine that can dig a trench 23 feet deep, and lift up to 14,000 pounds.

The now well-known Warner & Swasey Pin Drafter Intersecting Draw Frame was the first of the company's textile machines to reach production. Based on the ideas of one of the leading textile mills in the United States, this precision high-speed machine—operating at 1,500 faller drops per minute—is designed to do a superior job of readying yarn for spinning. It performs, in a single operation, drawing and combing jobs that formerly required several different machines to complete, while at the same time producing better yarn and radically reducing production costs. The Pin Drafter was the first production textile machine to offer completely interchangeable replacement parts. So successful was the machine following its introduction, that Warner & Swasey sold over 1,200 Pin Drafters to 220 textile mills by the end of 1950.

The latest Pin Drafter model, known as the "wide setover" machine and premiered at the Greenville Textile Exposition in 1958, offers a 33 per cent increase in input capacity and production over previous models. It can handle all precombing jobs, including backwashing and assembly operations. This, according to the company, opens up many entirely new mill applications for efficient pin controlled drawing.

A noteworthy feature of the latest model is a new balling head unit which delivers an 18" x 24" ball up to 50 pounds in weight. The longitudinal, variable drive ball creel can accommodate twelve of these 50 pound packages or additional smaller ones.

Single and dual can delivery systems also can be selected, so that a mill can produce the exact type of package needed to satisfy its individual requirements.

Warner & Swasey-Sulzer Weaving Machines shown undergoing final assembly at Cleveland.

This high-speed weaving machine, in slightly modified form, is now also being purchased by steel fabricating companies for use in the production of quality metallic insect screening for windows and doors.

Studies conducted throughout the textile industry in the late 1940's convinced Warner & Swasey engineers that the conventional weaving loom was far out of date, and that great improvements could be made if machine tool engineering and design principles could be applied to the problem. It soon became apparent, however, that the most promising design ideas had been patented by the famous Swiss precision machinery firm, Sulzer Brothers.

Hence it was decided that it would be more expedient to carry on with the Sulzer Weaver than to start anew. A flying trip to Switzerland secured for Warner & Swasey exclusive rights to the Sulzer designs in the western hemisphere—only a few days before another American loom manufacturer arrived in Geneva with similar ideas.

GREENWOOD
MILLS

In use today in textile mills throughout North America, Warner & Swasey-Sulzer looms have cut fabric production costs, reduced waste, and have woven superior quality cloth at a speed undreamed of only a few years ago. So versatile and rugged is the machine's design, in fact, that today it is even being installed in slightly modified form by steel fabricating companies for use in the high-speed weaving of metallic insect screening for windows and doors.

Still a third textile machine, the Warner & Swasey Pacific Converter, was introduced to the world textile market in 1950. The Pacific Converter, in one operation, prepares synthetic fibres for drafting by cutting continuous rayon and nylon filament or "tow" to the correct fibre size for spinning, and can, simultaneously, blend wool or other synthetic materials into the finished sliver in exact, preselected proportions. The machine also heat stretches fibres.

In 1954 Warner & Swasey began production of its fourth precision textile machine, a device for the one operation twisting and winding of heavy cord, called the Whirlwind Twister Winder. This machine, operating at more than twice the speed of any previous equipment, features highspeed twin heads which twist and wind uniform, knotless packages of cord, yarn or twine in a range of 2,000 to 50,000 denier. The Whirlwind handles nylon, dacron, polyethyelene and other synthetics, as well as natural fibers with equal ease. Cords and yarns produced on the machines are used today as carpet tufting, industrial sewing threads, belt, hose and zipper cords, netting and fishing lines, maritime and industrial ropes, duck yarns, and a host of similar applications.

In the rope-making industry, the Whirlwind Twister Winder is regarded by one leading New England producer as the biggest improvement in rope making he has seen in the last 25 years! This company uses the machine in the production of top quality nylon and dacron mooring and tow lines for naval applications.

Today, with more than 79 years of precision manufacturing experience and a skilled working force of over 3,000 people, The Warner & Swasey Company operates giant plant facilities in Clevelenad, Ohio, plus a large new plant at New Philadelphia, Ohio. The company's Duplex Division plant at Lansing, Michigan, and Badger Division plant at Winona, Minnesota, specialize in earthmoving machinery and truck production.

Looking to the future, Warner & Swasey is sincere in its belief that its precision machines, famous for quality and performance in many different industries, will continue to lead the way toward tomorrow's higher production at lower costs.

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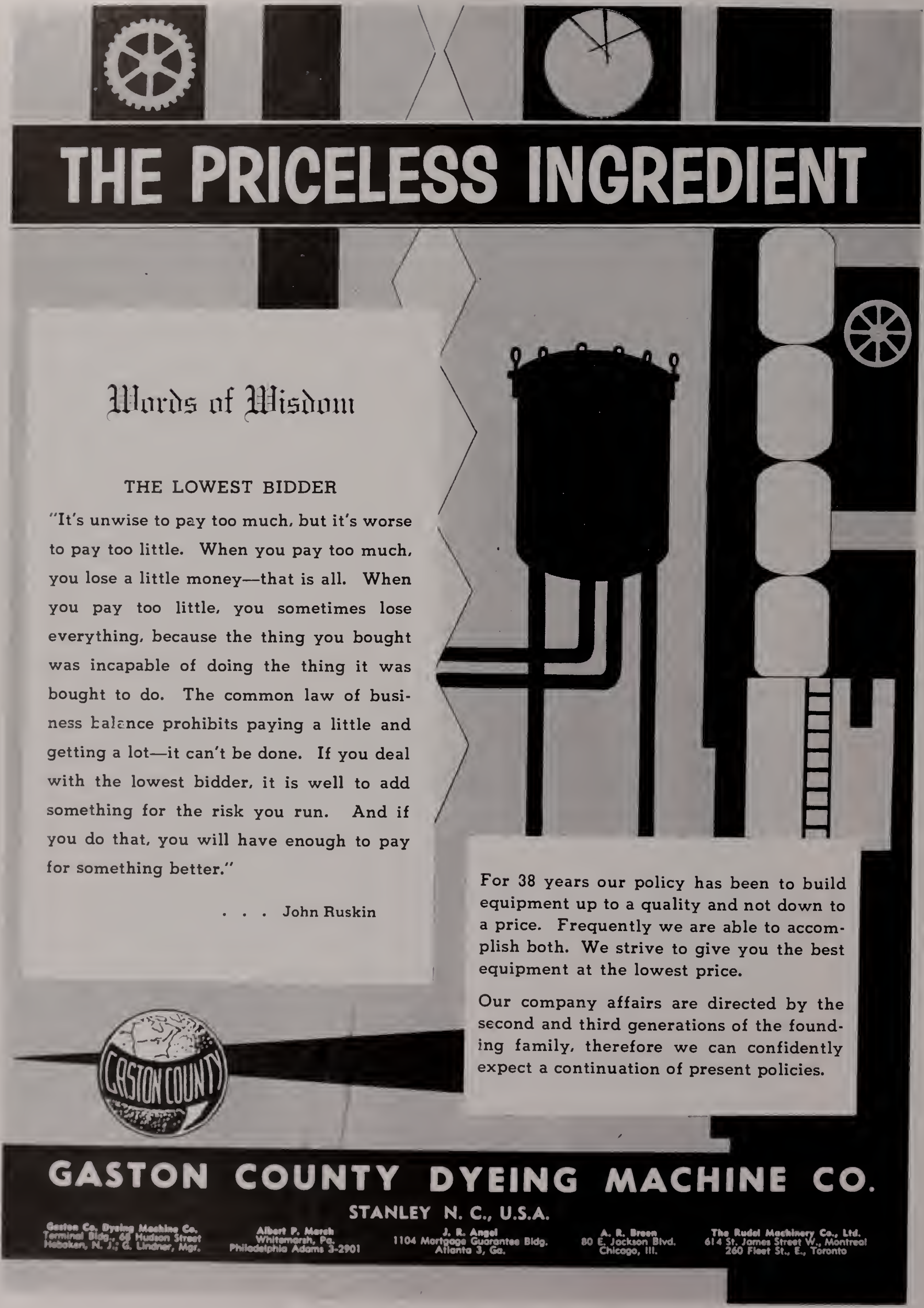

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Words of Wisdom

THE LOWEST BIDDER

"It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money—that is all. When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better."

. . . John Ruskin

For 38 years our policy has been to build equipment up to a quality and not down to a price. Frequently we are able to accomplish both. We strive to give you the best equipment at the lowest price.

Our company affairs are directed by the second and third generations of the founding family, therefore we can confidently expect a continuation of present policies.

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614 St. James Street W., Montreal
260 Fleet St., E., Toronto

Automatic Doffing Machine

Deering Milliken Research Corporation

An automatic doffing machine, designed to replace the manual doffer with a machine tender and to reduce sharply down time of spinning frames for doffing, has been developed by Deering Milliken Research Corp.

The automatic doffer reduces the down time of the spinning frame to about 15 percent of that required for conventional hand doffing, resulting in an 85 per cent savings in down time. The research corporation estimates the automatic doffer will result in doffing labor savings of 30 per cent to 50 per cent plus substantial savings in indirect labor costs and fixed overhead cost. In adition, yarn quality is improved.

The new machine lifts full bobbins from an entire frame in one gentle motion. The same machine, previously loaded with empty bobbins, then drops these into place.

The automatic doffer can be tied into material handling systems to preposition bobbins for spoolers and quills for looms. The new equipment can be counted on to effect substantial reductions in battery filling and spooler tending costs, according to DMRC.

Improved spinning efficiency will result in increased production from existing plant and equipment, officials continued.

Mechanical doffing leaves a free tail of yarn which eliminates the conventional unwinding operation by the operator on quills and bobbins. Machine handling of yarn is also expected to reduce the waste resulting from greasy and dirty yarns caused by manual handling.

The automatic doffer, DMRC believes, will pay for itself in tangible savings plus offering many additional intangible benefits.

"This automatic doffer represents the first successful atempt to bring mechanization into this key operation in spinning," a DMRC official said. "In the more than 100 years since machine spinning replaced the hand spinning wheel, textile men have dreamed of an automatic doffer. Now it is here."

DMRC said it had been working on the project for more than five years. A number of different approaches were taken to the problem of lifting full bobbins and replacing them with empty bobbins. The automatic doffing machine unveiled here employs a rubber grasper pneumatically controlled to remove the bobbins gently.

Most previous attempts to develop automatic doffers have been on a spindle to spindle basis rather than on the basis of an entire frame.

The DMRC automatic doffer, after removing full bobbins from an entire frame and replacing them with empty bobbins, is moved on overhead rails to a loading station. Full bobbins are transferred to other automatic handling equipment and empty bobbins, automatically placed in the loading station, are picked up. The machine is then ready for another doff.

DMRC officials expressed great satisfaction with results achieved with the automatic doffer during extensive tests in a nearby textile mill.

The automatic doffer developed by Deering Milliken Research Corp., offers many advantages. Among them are:

Personnel

1. Elimination of the doffer job classification.
2. Elimination of strenuous physical effort in doffing.
3. Great reduction in time for personnel training

Labor Savings

4. Reduction in labor required to doff frames
5. Reduction in spinning operator's direct labor.
6. Reduction in labor required for changing travelers and cleaning spindles.
7. Reduction in winding costs.
9. Elimination of boxes and box pushing in spinning.
10. Reduction in amount of spindle plumbing.
11. Opportunity for automatic yarn marking.

Increased Efficiency

12. Increased spinning efficiency.
13. Great reduction in down time at doffing.
14. Reduction in fixed overhead cost per pound.
15. Reduction in indirect labor spinning costs (spindle hour basis).
16. Increased yarn production.
17. Higher spooler efficiency.
18. Reduction in number of idle spindles.
19. Reduction in short doffs due to spindles out of plumb.
20. Reduction in short doffs due to interference.

Improved Quality and Reduced Waste

21. Elimination of high-low bobbin problem.
22. Less waste and less oily yarn.
23. Better plumbed spindles to give fewer ends downs and piecings.
24. Reduction in amount of damaged yarn.
25. Less sloughed yarn in doffing.
26. Less occurrence of tangled doffs due to separators being improperly positioned.
27. Fewer knockouts at spooler.

Increases in Potential for Additional Automation

28. Application of same pneumatic doffing technique to roving frames.
29. Added attractiveness for block creeling of spinning room frames.
30. Possibility of truck elimination allowing narrow aisles and cross alleys, and reducing floor damage.
31. Reduction in separator breakage through the elimination of trucks.
32. Reduction in importance of doffing and battery filling as a factor in determining optimum ring size and quill size.

W. B. Simmons Machinery Company

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Burlington INDUSTRIES, INC.

EXECUTIVE OFFICES: GREENSBORO, N. C.

Outstanding Seniors - - -

By Phillip Kennedy

Gail C. Guinn is a Textile Engineering senior from Camden, S. C. At present, he and his wife reside at Clemson.

Gail has had considerable experience in the textile industry. He worked for six months in a cotton mill in Camden, and for four and one-half years with E. I. duPont also in Camden. While gaining valuable experience, Gail has also been using his earnings to pay his way through Clemson. He has paid all of his expenses by working.

Extra curricular activities also play a part in his life at Clemson. He was a member of the freshman baseball team and since then his interest in athletics has been shown in his active participation in the intramural program. He has played intramurals each year while at Clemson.

Gail plans to join Callaway Mills in LaGrange, Georgia upon graduation.

Norman D. Davden, Jr., better known as "Sonny," hails from Albertville, Alabama. Sonny is a Textile Engineering major who combines his studies with many varied extracurricular activities.

At the present time Sonny is a member of the Tiger varsity golf squad. He is also a member of Phi Psi and NTMS, both textile societies.

Sonny has also shown great interest in the ROTC program while at Clemson. He was a member of the Pershing Rifles his sophomore year and a member of Executive Sergeants his junior year. At present he is a Distinguished Military Student and serves as a company commander.

Sonny's textile experience has been in his home town during the past two summers. He has been employed with Kendall Company and gained valuable practical knowledge while there.

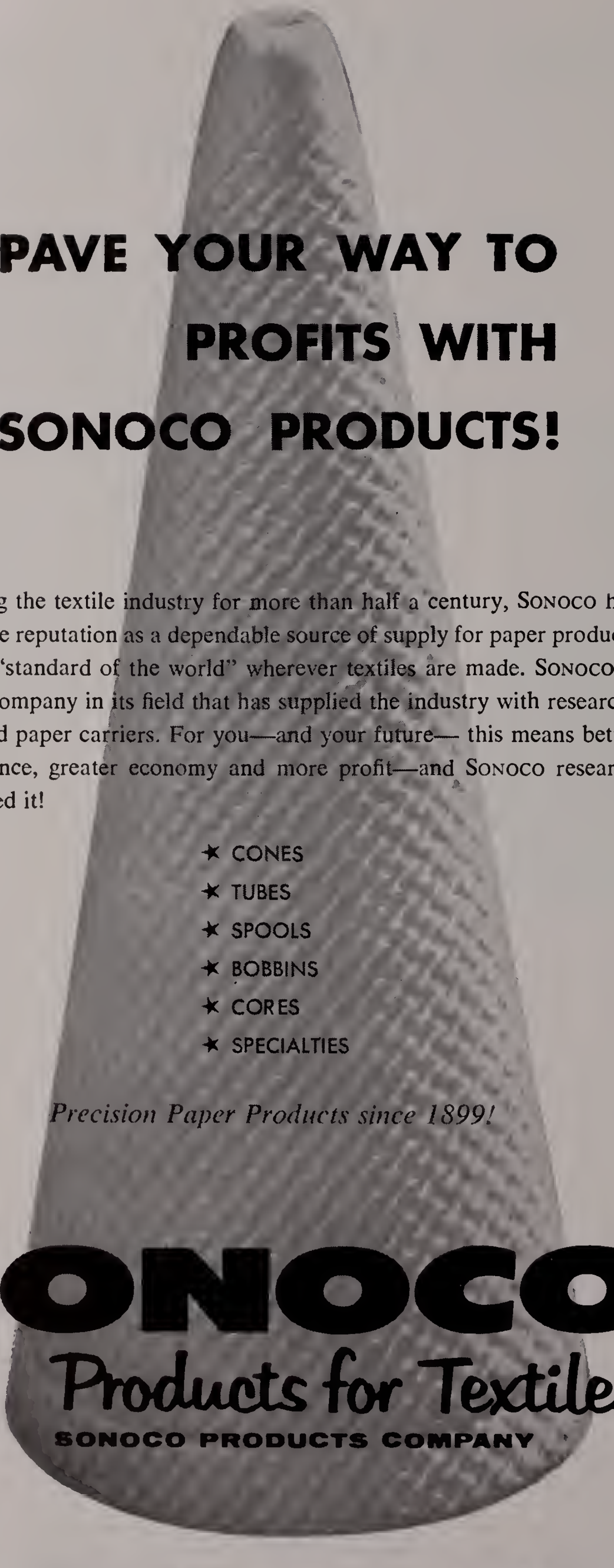
E. Randall Poole is a Textile Chemistry senior from Traveler's Rest, S. C. He and his wife now live at Clemson with their four children.

Randall is a veteran of two years service as a military policeman at Fort Knox, Kentucky.

Other extra curricular activities include Phi Psi, NTMS, SAM, AATCC (Vice President) and a part in the production of Tigerama.

Randall is the holder of the Owens-Corning Fiberglas Scholarship. He also held it his junior year. He is helping his expenses by part time jobs. These include: Music Director at the First Baptist Church, Walhalla; and Pick Clock reader at Courtenay Mill.

In addition to Courtenay Mill, Randall has worked at Renfrew Bleachery, Brandon Mill, Poinsett Mill, and the Textile Research Department.



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1414-A

SAMM

By Junekey Lee

Samm is the name of a bast fiber that grows in the Southern part of Korea. It is my desire to describe here what I know of this seemingly unidentified natural fiber—among the list of many different bast fibers mentioned in Matthew's **Textile Fibers**, none seems to represent this fiber.

The fiber is obtained from plants and it is one of the oldest natural fibers that have been used by men. The plants are raised in a fairly rich and wet field during warm and mild weather. The cultivation, which is once a year, begins sometimes in the first part of April with seeding and lasts about three months. When the plants are fully grown the height will vary from five to eight feet. There are only a small amount of leaves on the plants, and they are mostly located on the top portion of the plants. The plants grow very straight and have flowers after a certain period of the time of maturity. It is important to cut the plants before that period because the fibers obtained from flowered plants are found to be too weak to use.

For the preparation of Samm fibers all the plants are cut down and subjected to a process technically known as "rippling" which removes the leaves away from the plants. Each plant has different size of diameter, but it falls in general into the range of 1/8-3/8 inches. The stem of the plants decreases in size as moving from bottom to top. After rippling the remaining stalks are tied in bundles and kept in a shady area for a few days. Unlike the process of some bast fibers (such as Flax), the preparation of this fiber requires a treatment of steam before even starting to separate the fiber portion from the woody stalk. The principle behind the steaming is to cook the plants so that the fiber portion, the entire out-layer (skin) of the stalk, would be easily skinned or removed from the woody stalk. When the plants are properly steamed, the entire out-layer, fibers, parts are stripped off by a single hand operation starting from the bottom of the stalk all the way to the top. A simple analogy to this process is the peeling a banana. The stripped stalks are white with a hole running lengthwise through the center, and they are no longer useful to the preparation process of fiber. At this stage Samm is in the form of a ribbon-like strand being 5-7 feet long and 1/4-3/4 inches wide. While wet, even a single strand has unusual strength, and its color is dark green. The ribbon-shaped Samm strands are sun-dried, and as drying takes place, they change from dark green to yellowish green color. The Samm of this stage gives a harsh feeling and has practically no strength. Instead, it has a tendency of becoming broken into pieces if pulled or creased. The dried Samm strands are tied in bundles and kept in water for many hours before making an actual yarn out of them. With water each strand is helped to recover its original strength and also helped to be cleaned to some extent, and it is made easy for an operator to split the wide ribbon of Samm into many narrow strands — about 1/16 inch of width. These narrow strands of Samm fiber are linked together, by rubbing the one end with the other, to form one continuous strand, whose length may be equivalent to the amount of roving on a roving bobbin. At this stage the strand may be regarded as yarn, though it is not round but rather flat, and it can be made into ropes for pulling or tieing. Further twisting of the yarn enables it to be woven into cloth. Finer yarn is in general used to weave summary shirt, whereas coarser one is employed to make table covers and any type of cover sheets.

Under the microscope the commercial Samm fiber is seen to be somewhat similar to the general cross-sectional view of the commercial fiber of Hemp. The diameters of the individual fibers are uneven and there is an open lumen in the center. The elementary fiber is rather similar to Flax, being cylindrical in shape though somewhat polygonal in cross-section. In the cross-section a very small open lumen is seen like a small dot. The longitudinal view of Samm fiber under the microscope is more or less similar to that of Hemp exhibiting frequent nodes. More than one lumen, along with striations, are seen in the commercial fiber whereas in the elementary fiber only one clear and broad lumen is observed. Toward the end of the fiber the lumen becomes narrower and narrower and finally forms a line.

The fibers are composed of small elements of cellulose and some interesting properties are observed when treated with chemicals. When treated with Herzberg's stain (Zinc-Chlor-Iodine), Samm, like Flax or Hemp, changes to a purplish-brown color without being destroyed; however, Samm seems to change to a deeper shade of purple than Flax or Hemp. When treated with Concentrated Sulfuric Acid, a very slow reaction takes place. After 15 minutes the Acid starts to penetrate the fibers, and Samm then turns to deep reddish-brown color whereas neither Flax nor Hemp changes color with acid. After approximately twenty minutes the fiber is completely destroyed leaving only foreign matter on the slide. Like most of the bast fibers, Samm is not chemically affected by Caustic Soda although it is purified.

Judging from the results of my experiments, I would say that Samm should not be considered the same as Hemp or Flax. It seems obvious that Samm is one of many bast fibers with its own botanical, physical, and chemical characteristics.

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Electrical Patterning Devices

Cobble Machine Company

During the past few years, great interest in electrical patterning devices for tufting machines has developed. When one considers that well over 50% of the total amount of soft floor covering sold in the United States is of a tufted variety, it can well be understood why machinery makers, as well as carpet producers have directed their interests and efforts toward mechanisms that are capable of making many different and varied textured types of carpet in order to continue to stimulate consumer interest.

In the development of an attachment for a tufting machine, many problems are encountered which can only be solved by time and trial. In some instances a control or attachment is not readily accepted due to the lack of understanding as to just what the attachment or component is supposed to do.

In todays time, with all the new types of electrical components that are available, it is no wonder that when someone is first viewing a machine with several hundred wires running in many different directions that the numerous advantages gained using electronic equipment is often overlooked and misunderstood. However, on closer examination it is usually apparent that there is nothing complicated about the device at all, and that designing the mechanism for electrical control actually makes a compact flexible unit out of what might be a bulky less flexible piece of machinery.

The simplicity of the various systems that are being used can best be explained by outlining the mechanical operation along with the electrical system that is being used to control it.

The Cobble Universal Type Pattern Attachment employs the simplest electrical system and incorporates only a pattern scanning device and a a solenoid for each control unit. The attachment consists of a pair of yarn feed rolls between which the yarn is threaded. The rolls are striped with alternating rings of friction surface and smooth surface, each of which is 3/16" wide. The rolls are driven at different speeds with an approximate 2 to 1 speed differential, and the rings on the front roll coincide with the smooth rings on the rear roll, and vice versa. Immediately above the rolls is a series of yarn guide fingers, each of which accommodates two ends of yarn, leading to two adjacent needles. Each finger is solenoid controlled and normally aligns the two ends of yarn with the friction ring on the slow speed roll, allowing them to be driven by this roll and to slip on the smooth portion of the high speed roll, thus producing low nap.

When the pattern calls for it, the solenoid controlling the yarn guide finger is energized, switching the finger laterally to align the ends of yarn with the friction ring on the high speed roll, thus changing the feed rate of the yarn, and causing the machine to produce high nap.

One of the latest applications of this solenoid controlled system for patterning has been incorporated in the Cobble Loop-Cut Machine which produces patterns by forming high cut pile and low loop pile from the same needle. All of the tufting is done in straight lines and the basic machine is much the same as an ordinary tufting machine. However, the inner parts of the tufting mechanism have been changed and redesigned to allow cut pile or loop pile to be produced from the same needle and using only one cut pile hook.

By combining the operation of the loop-cut mechanism with the Universal Type Pattern Attachment, designs can be made in relief or sculptured pattern and the different effects are obtained by tufting the high portions of the pattern in cut pile and low portions in loop pile.

The loop-cut mechanism is merely an individual loop stripper finger working with each cut pile hook. Through the use of solenoids, these loop stripper fingers can be actuated to work separately or collectively by electrical pattern drum control.

The machine is set to make cut pile and when the pattern calls for loop pile, the loop stripper finger pushes the loop off the hook before it is cut.

Combining the Universal Type Pattern Attachment, which controls the amount of yarn fed to the needle, with the loop-cut attachment, it is then possible to control the height of pile formed in the cut pile and loop pile.

Normally the electrical control of the Universal Pattern Attachment is wired into the control fingers of the same pattern drum as the loop cut mechanism. Consequently, one pattern drum controls two operations of the design in cut or loop pile, and also control of the portions of pile made in high cut pile and low loop pile.

Another example of this solenoid system of patterning is the Cobble Controlled Needle Machine. This machine produces patterns in cut pile tufting. All of the tufting is in straight lines, and designs are produced by taking certain needles out of operation, as dictated by the pattern drum. The needles are normally locked in a tufting position in the needle bar which reciprocates up and down as usual. The needle holders are locked to it by means of a latch pin which is urged into engagement by a light spring. Individual solenoids control the respective latch pins, and when energized, retract the latch pin from the needle holder. This allows its associated needle to remain in the "up" position. The balance of the needles do not penetrate the backing cloth at all, and that portion of the backing cloth which passes under the needle while it is disengaged is left completely bare.

The solenoids for both the Loop-Cut and Controlled Needle Machines are controlled by a pattern drum which has the pattern cut into its surface in the form of annular milled grooves, one for each solenoid control finger. The length of each groove represents the amount of time that the solenoid is energized. When a finger drops into a groove, it closes an electrical circuit that energizes the solenoid. When a finger rides up out of the groove, it breaks the circuit and the solenoid is de-energized.

The advantages of the solenoid and pattern scanning finger is the fact that very few parts are used which reduces maintenance and parts stocking problems.

Each needle holder or yarn guide, as the case may be, is controlled by one scanning finger and a solenoid, and then these two components are repeated for the entire tufting width.

A new pattern control device operated by a beam of light is now available for use on the Cobble Single End Scroll Type Pattern Attachment. One hundred and twenty small rectangular Silicon Solar Cells convert this beam of light into electrical energy.

The important components in the active part of the solor cell is the silicon material and a p-n junction that is now used in rectifier, transistors, and other semiconducting devices. The term p-n junction stands for the boundary layer between p-type and n-type semiconducting material.

When light falls on the p-n junction, photons having sufficient energy to break valence bonds in the crystal create hole electron pairs. If the photon is absorbed near the junction, the hole electron pairs will diffuse into the junction region. Then the junction field will cause them to separate so the holes flow into the n-type material. This builds up an external voltage in the device and causes current to flow through a load. The light acts as a current generator.

Response time for the cell is 20 micro-seconds or less which allows for instantaneous control. The replacement problem is virtually eliminated due to a permanent life time diffused p-n junction.

A very low light source is used on the control and from this light source the solor cell generates a current of approximately 60 micro-amperes. This small amount of current is then fed into a n-p-n type transistor which operates a mercury wetted relay and in turn controls the electro-magnetic clutches.

In the past, some trouble has been experienced when using an open type contact because of the lint and fly that is present around tufting machines. The lint tends to collect on the contactor and either arcs across the points or completely insulates one side from the other. But now, by using the solor cells as a pattern take off signaling device, the last mechanical switching or contact in the whole electrical system has been eliminated.

In order to acquaint the reader with the specific merits of using the solor cells as a pattern take off mechanism, the operation sequence of the Single End Scroll Pattern Attachment is as follows:

A series of individual yarn feed rolls (120) are each driven at two different speeds by two electro-magnetic clutches mounted on the same drive shaft. The clutches are running at an approximate 2 to 1 speed differential and the speed of each roll is selectively controlled by a pattern drum which carries the pattern on a shell. This shell is very easy to change, and different patterns are transmitted electrically by means of a shutter mechanism which either blocks light from the solor cell or permits light to strike its surface.

The attachment is normally supplied with the yarn feed rolls running at slow speed or low pile height, which means the slow speed clutch is electrically engaged. When the pattern calls for it, the speed of each roll, individually or collectively, is increased by switching the electrical current to the fast running clutch; thereby speeding up the roll and delivering more yarn to the needle to produce high nap.

The electrical control system has been made into modular units, allowing for easy servicing should the need arise. Each yarn feed roll unit is controlled by one plug-in module. The components in the plug-in module consist of a silicon rectifier for both the 90 volt circuit and the 20 volt relay circuit, a power transistor, and a mercury wetted relay.

Another feature of the Single End Scroll electrical system is the way in which the modular plug-in units are used, one cabinet houses the units for the top row of yarn fed rolls and the other cabinet houses the units for the bottom row of yarn feed rolls. Each cabinet is divided into 6 separate plug-in receiving units, with each receiver controlling 10 plug-in units or in other words, 10 yarn feed roll units. In addition to an on-off control switch for each of the plug-in receivers, they also contain a three position switch for controlling the independent operation of the 10 units. Consequently, the speed of 10 units can be set for running at a continuous slow speed, continuous fast speed, or at the speed required by the pattern.

The pattern is put on a phenolic or aluminum drum in the form of an adhesive plastic tape 1/16" thick. The drum is first completely covered with the tape and then a paper pattern is placed around its circumference to guide the cutting of the desired pattern. Nothing more than a pin knife is needed to cut out the desired portions of the tape and by cutting out selected areas for each control finger the pattern is formed.

The control fingers are actuated by the difference in height between the un-cut and cut-out portions of the plastic tape. The difference in height causes the finger to raise and lower a shutter in front of the solor cell; thereby blocking light from the cell or allowing it to strike the cells surface.

When the light is blocked from the cell the respective yarn feed roll runs at the slow rate delivering a small amount of yarn which makes low nap. When the shutter is raised or the finger is on high portion of the pattern, light is permitted to strike the cell. This, generates the necessary current to switch from the slow clutch to the fast clutch; thereby delivering a greater amount of yarn which makes high nap.

All of the electrical systems contained in the Cobble Pattern Attachments for tufting machines are very simple circuits and only look complex due to the number of components required to control the widths needed. However, each control is merely duplicated according to the gauge or spacing of the needles in the machine. Often times, this gauge is 1/8 of an inch or less so it is easy to see how very well electrical components lend themselves to small space requirements because of the need for only a wire to translate motions into work.

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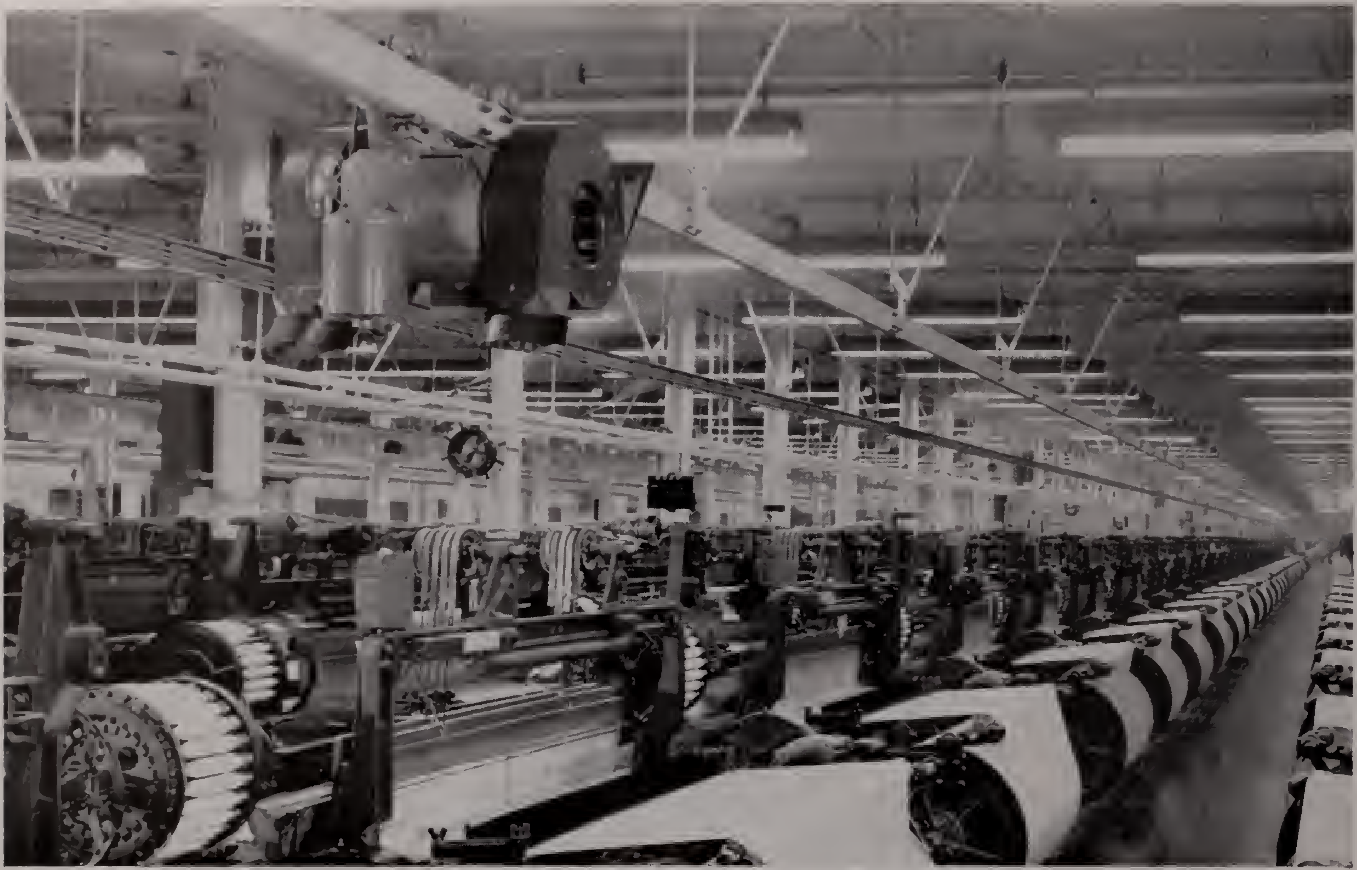

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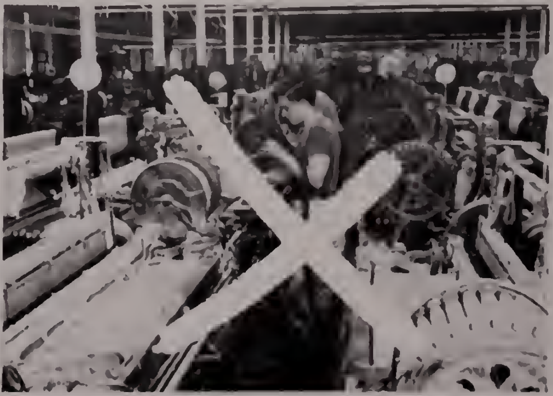

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SPONSORED RESEARCH ANSWERS: "WHAT HAPPENS IF?"

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Through sponsored research by Columbia-Southern Chemical Corporation at Clemson College, School of Textiles, Columbia-Southern recently announced a new bleaching process.

The idea for this new approach to cotton bleacing was originated by Professor Joseph Lindsay of the Clemson Textile School, and the initial laboratory work, as well as the pilot plant runs, were conducted in the Textile Chemistry Department at Clemson. Since its conception many man-hours have gone into a thorough study of the variables which arose as the work progressed. To date, four mills in the United States have made mill runs on this process and find the results satisfactory. They are currently preparing to utilize this new bleaching method as a standard procedure for full production on this arrangement.

Cotton fabrics as they reach the bleaching operation contain many impurities. Among these impurities are wax, oil, dirt, grease, graphite, and motes. To obtain a well bleached fabric, it is imperative that the goods be treated so as to remove these impurities and therefore, render the material more susceptible to the bleaching operation. In the normal bleaching operation, wide use is made of alkaline treatments, caustic soda is usually employed as the alkali for a scouring or cleaning step prior to hydrogen peroxide bleaching. The initial preparation of the cotton material is important and the more efficiently this part of the process is performed, the simpler the subsequent bleaching operation will be. The amount of more costly bleaching materials may actually be reduced. In this new process, we find that by the addition of a small amount of sodium hypochlorite, plus a small amount of sodium silicate to the alkaline solution, a better cleaning operation is performed. This allows a substantial reduction in the amount of hydrogen peroxide used in the peroxide bleaching operation.

Another interesting phase of this process is that desizing can be accomplished simultaneously with the alkaline treatment. As most woven goods are sized prior to weaving, a thorough desizing operation must be performed before bleaching. Undesized cotton goods run directly from the singer into the alkaline solution containing caustic soda, sodium hypochlorite, and sodium silicate, are desized quite rapidly and to such an extent as to yield a bleached end product of equal or better strength, equal or higher whiteness with substantially lower chemical cost per pound of goods processed. Basing cost estimates on initial plant runs we are confident that application of this process could mean an over-all reduction in chemicals costs of approximately 30%.

This process may be used to bleach cotton in various forms such as raw stock, yarn, woven, and knit goods. The operation is carried out on existing equipment now employed to bleach cottons in these various forms. Due to the many ways of bleaching cotton goods and the complexity of modern dyeing and finishing operations, four sequences are suggested:

1. Cotton to be bleached continuously and finished in the normal manner.
    a. Singe (if required)
    b. Alkaline Treatment + Sodium Hypochlorite (if goods are sized, omit desizing operation.)
    c. Steam
    d. Wash
    e. Hydrogen Peroxide Treatment
    f. Steam
    g. Wash

2. Cotton to be batch bleached and finished in the normal manner.
    a. Singe (if required)
    b. Alkaline Treatment + Sodium Hypochlorite (if goods are sized, omit desizing operation.)
    c. Wash
    d. Hydrogen Peroxide Treatment
    e. Wash

3. Cotton to be bleached continuously and resin finished.

   a. Singe (if required)
   b. Desized with ensymes (if required)
   c. Wash
   d. Alkaline Treatment + Sodium Hypochlorite
   e. Steam
   f. Wash
   g. Hydrogen Peroxide Treatment
   h. Steam
   i. Wash

4. Cotton goods to be batch bleached and resin finished.

   a. Singe (if required)
   b. Desize with ensymes (if required)
   c. Wash
   d. Alkaline Treatment + Sodium Hypochlorite
   e. Wash
   f. Hydrogen Peroxide Treatment
   g. Wash

This process is designed to allow immediate conversion on present bleaching equipment employed in conventional hydrogen peroxide bleaching operations. An exception may be in the case of single stage continuous type ranges.

Due to the variety of machinery used and the various forms of cotton now being bleached, it is difficult to give detailed formulations so in general, the chemicals used in the alkaline treatment are:

1. Caustic Soda—2-4% (by weight)
2. Sodium Hypochlorite—0.02-0.20% (by weight as available chlorine)
3. Sodium Silicate—0.5% (by weight)
4. Other additives as needed

Chemicals used in the hydrogen peroxide treatment are:

1. Hydrogen Peroxide—0.5-1.0% (by weight)
2. Sodium Silicate—0.5-1.5% (by weight)
3. Other additives as needed.

All chemicals used in the preliminary laboratory and pilot plant development of this technique are commercial chemicals and readily available.

Tests show that material treated by this technique has a uniform bleach with high brightness. The hand and absorbency are greatly improved. Absorbency on preliminary tests is in th range of 1 to 3 seconds as determined by AATCC Tentative Test Method 79—1954. Fluidities of 4-6 rhes have been found. Dyed samples of material bleached by this technique show uniform dispersion and good penetration. An overall increase in tensile strength of 5-10% has been obtained on goods treated in the laboratory and pilot plant operations.

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Not too smart and not too dumb
But not necessarily so.

At all times he must play an active role
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Eye upon doughnut and not the hole
Not too forceful and not too mild
Not too conservative and not too wild
But not necessarily so.

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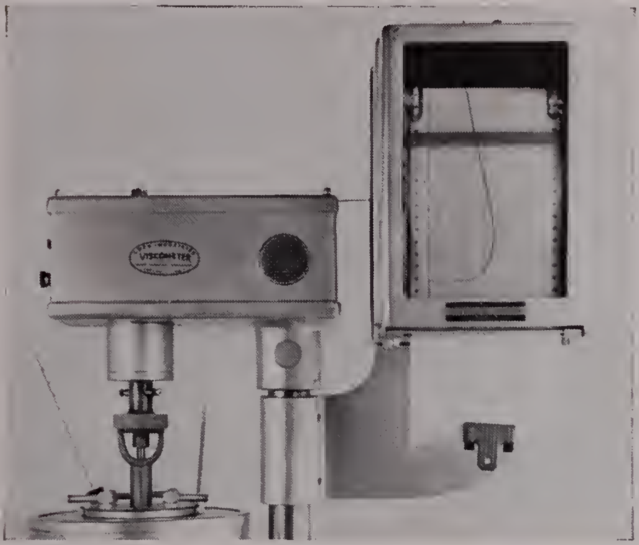
how to select the right starch or dextrin to do the job right!

Here are six of the more important tests for selecting the *right* starch or dextrin.

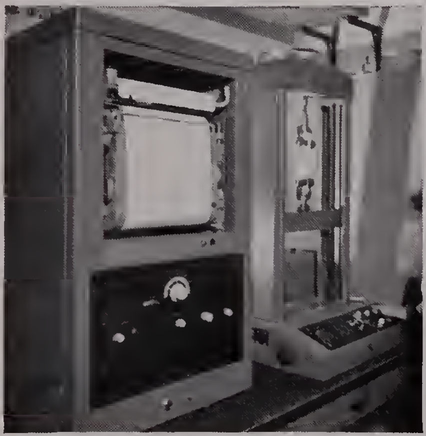
But whether you use these or other methods of testing, remember this: Staley's never-ending research and quality-control laboratories subject every type of starches, gums, dextrins to the most critical tests—not only the tests pictured here, but other demanding tests as well.

The result? A complete line of custom-made, uniform-quality products for sizing and finishing that meet your most exacting specifications.

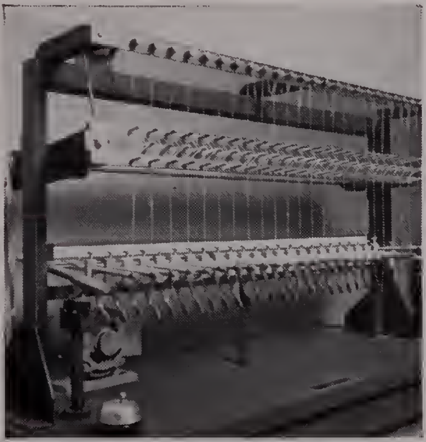


1. How does it rate on stability? Viscosity stability is a major factor in warp sizing, particularly under high-temperature conditions—and is essential for uniform added weight. This characteristic can be accurately evaluated with a Corn Industries Research Foundation Viscometer.

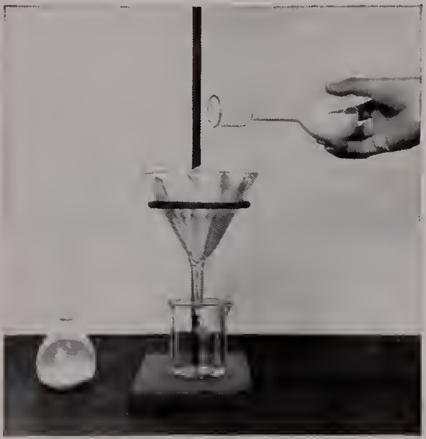
2. Is it the right viscosity? Proper size viscosity is important in almost every application and is a key factor in determining add-on for optimum weaving. The Scott Cup is one of the quickest, simplest, most efficient methods of checking viscosity.



3. What about tensile strength? Important too, is the effect of any treatment on the strength of yarns, fabrics. Tensile strength—ranging from delicate yarns to coarse, durable fabrics—may be determined with the "Instron" Tensile Tester.



4. How does it rate on abrasion resistance? The ability of a sized yarn to resist abrasion during the weaving operation must be carefully evaluated in choosing a starch. The "Walker" Abrader is widely used in this test.



5. Does it have the right solubility? Another important consideration in selecting the *right* dextrin is water solubility. This can be easily determined through a simple analytical procedure utilizing filtration and evaporation.

6. How does it rate on color? Generally, dextrins should be of good whiteness when they are to be used in finishing. Precise determinations of color present in dextrins are possible with the "Hunter" Colorimeter, shown above.

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